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AROMATHERAPY MASSAGE *OF LEMONGRASS, KAFFIR LIME*, AND LEMON TO INCREASE APPETITE, IGF-1 (Insulin-like *Growth Factor 1*) LEVELS, BODY WEIGHT, AND HEIGHT IN STUNTED TODDLER

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KEYWORDS
Stunting; aromatherapy massage; appetite; IGF-1 levels; weight; height

ABSTRACT
Stunting is a chronic nutritional problem caused by malnutrition over a long period of time, resulting in children becoming short. Stunting is not only a problem of impaired physical growth, but also causes children to become easily sick, impaired brain development and intelligence, so stunting is a major threat to the quality of human resources in Indonesia. Indonesia's stunting prevalence is 24.4% in 2021, based on the results of the Indonesian Nutritional Status Survey (SSGI) by the Ministry of Health. This figure is quite high and still above the standard tolerated by WHO, which is below 20%. For this reason, efforts are needed to reduce stunting rates with aromatherapy footing. The study aims to analyze the effect of aromatherapy massage on appetite, IGF-1 levels, body weight, and height in stunted toddlers. The research design used was pretest-postest with control group design. The number of samples in this study was 32 subjects, which were divided into two groups, 16 subjects in the intervention group were given aromatherapy massage 3 times a week with a duration of 15 minutes for 8 weeks and the control group was given standard care for stunting toddlers given PMT biscuits. The probability sampling technique is simple random sampling. The data studied were appetite, IGF-1 levels, body weight, and height of stunted toddlers. Data analysis using Wilcoxon Test, Man Wihtney Test, Paired T-test, and Independent T-test. The results show there were differences between before and after aromatherapy massage in the intervention group on appetite (P = 0.001), IGF-1 levels (P = 0.000), body weight (P = 0.000), and height (P = 0.000). Aromatherapy massage 3 times a week for a duration of 15 minutes for 8 weeks is effective in increasing appetite, IGF-1 levels, weight, and height of stunted toddlers.

INTRODUCTION
The toddler years (under five years) are an important age, where children's growth and development develops rapidly. Nutritional intake that suits their needs is needed at this age. The state of adequate nutrition has a significant impact on the sustainable health of toddlers into the future. During this period, children are vulnerable to experiencing nutritional problems. One of the nutritional problems experienced by toddlers is stunting (Uce, 2018).

The incidence of short toddlers or stunting is a situation where the child's height is shorter or lower when viewed from age standards. Stunting is a chronic nutritional problem caused by inadequate nutritional intake over a long period of time, resulting in children being short (Israini Suriati, 2016). Stunting is not only a problem of impaired physical growth, but also causes children to become sick easily, impaired brain and intelligence development, so stunting is a major threat to the quality of human resources in Indonesia (Indonesian Ministry of Health, 2018a)

World Health Organization (WHO) Child Growth Standards determine stunting from the anthropometric index of body length compared to age (PB/U) or height compared to age (TB/U) with a limit (z-score) below the standard deviation (<-2 SD) (Black et al., 2013)(Budiastutik & Nugraheni, 2018). The prevalence of stunting in 2017 among toddlers in the world was 22.2% or approximately 150.8 million, more than half of stunted toddlers came from Asia (55%) and more than a third (39%) lived in Africa. Of the total 83.6 million stunted children under five in Asia, the largest contributor comes from South Asia (58.7%) and the lowest proportion in Central Asia (0.9%) (Indonesian Ministry of Health, 2018b)In 2020, Indonesia itself had the second highest prevalence of editing in the Southeast Asia region after Timor Leste with a prevalence rate of 31.8% (Databooks, 2021).

Indonesia's stunting prevalence is 24.4% in 2021, based on the results of the Indonesian Nutrition Status Survey (SSGI) by the Ministry of Health. This figure is quite high and still above the WHO tolerated standard, namely below 20%. National level findings from the 2021 Indonesian Nutrition Status Survey (SSGI), Provinces, and Districts/Cities, from 35 Provinces in Indonesia, the prevalence of stunting in West Sumatra is at 23.3%, which is still far from the national target in the 2024 RPJM, namely 14%.

West Sumatra consists of 12 districts and 7 cities. Of the total 19 regencies and cities in West Suatra Province, the lowest prevalence of stunting is in Solok City at 18.5%, however this figure is still below the 2024 RPJM target (Indonesian Ministry of Health, 2022) In 2024, the government hopes that the stunting rate in Indonesia will only be 14%. Efforts are needed to reduce the stunting rate of children under five years of age by 2.7% per year to achieve this goal (Coordinating Ministry for Human Development and Culture of the Republic of Indonesia, 2022).

Nutritional factors are related to stunting, and other conditions such as genetics, hormones, as well as psychosocial environmental factors can contribute to growth disorders (Almaitser S, 2017). According to the Ministry of Villages, Development of Disadvantaged Regions and Transmigration, stunting in children under five is included in chronic malnutrition caused by several factors, including socio-economic conditions, nutrition of pregnant women, infant morbidity rates, and inadequate nutritional intake of infants (Remarks et al., n.d.).

In line with Aditiawati's statement that child development is a process of various factors, including hormonal, psychosocial and environmental factors, especially nutrition, interacting with each other (Aditiawati, 2019). The impact of stunting is closely related to appetite and growth disorders. Appetite is the desire to eat and choose food according to what is desired. During the toddler period, the child's appetite begins to be erratic and difficult to predict, resulting in the child's appetite decreasing (Almaitser, 2017).

Lack of food intake such as protein can damage bone mineral by inhibiting Insulin-like Growth Factor 1 (IGF-1), besides reduced plasma insulin caused by energy imbalance resulting in decreased synthesis of IGF-1 in the liver, disrupting the performance of IGF binding protein-1 , thyroid hormone, and other systemic factors involved in Fibroblast Growth Factor 1 (FGF-1) all contribute to linear growth (Gat-Yablonski & Phillip, 2015). The effects of growth hormone Growth Hormone (GH) are mediated by Insulin-like Growth Factor 1, which also regulates somatic growth and organ development, including brain development (Arifiyah & Purwanti, 2017). Despite its much stronger growth-stimulating effects, IGF-1 is a GH delivery protein with a structure and function similar to insulin (Putri & Natsir, 2021).

Using pharmacological and non-pharmacological methods can overcome difficulty eating or lack of appetite. The administration of multivitamins and other micronutrients is combined in pharmacological treatment efforts. On the other hand, there are non-pharmacological treatments such as herbal medicine, massage and acupuncture (View of The

Effect of Tui Na Massage on Appetite in Toddlers: Literature Review, nd). The World Health Organization (WHO) states that traditional medicine must be adopted and developed in every country. To maintain, improve and maintain their level of health, the global community is currently using traditional health services with the understanding of returning to nature, one of which is massage (Indonesian Ministry of Health, 2015).

Massage is a form of touch therapy that functions as a treatment technique. Touch and gentle stimulation are basic needs for babies that can stimulate and stimulate the baby's appetite. So with baby massage it will cause an increase in appetite which will ultimately increase the baby's weight (Malikhah et al., 2019; Suharta & Anggrianti, 2021).

Research conducted by Happy Marthalena at the Baawang Palangkaraya Community Health Center in 2019 on 15 babies showed that there was a significant effect of tuina massage on increasing difficulty in feeding toddlers before and after massage, where 15 respondents (100%) experienced difficulty in breastfeeding. Another study by Halimatus Sa'diah and Rahma Kusuma Dewi on toddlers aged 12-59 months with 32 respondents having difficulty eating, 16 respondents were given massage and 16 respondents were given lemongrass oil aromatherapy, showing that both massage and lemongrass aromatherapy had an influence in overcoming children's eating difficulties. toddler. However, massage is more effective in overcoming feeding difficulties in toddlers than giving lemongrass aromatherapy (Saidah & Dewi, 2020).

Journal of Pediatric Nursing (2016) in one of their publications mentioned the efficacy and safety of using oil in massage to increase baby growth. Research shows that massage using oil can increase a baby's weight, body length and head circumference. In conclusion, massage using oil effectively increases the physical growth of babies (Li et al., 2016)

Aromatherapy can be given by inhaling, compressing, applying to the skin, spraying, or mixing it with water to soak the whole body or certain parts of the body. Massaging will make it work better (Permenkes No. 8 of 2014 concerning SPA Health Services [JDIH BPK RI], nd). In the massage process with aromatherapy, aromatherapy stimulates the central nervous system through the distribution of molecules that spread aroma, so it is useful for treatment and relaxation (Kasmiatun, 2017; Nirnasari, 2018).

Based on this explanation, researchers are interested in conducting research on the effectiveness of aromatherapy massage, which in this study uses lemongrass, kaffir lime and lemon aromatherapy oils in the form of Increased Appetite Massage Oil on increasing appetite and IGF-1 (Insulin-like Growth Factor 1) levels), body weight and height in stunted toddlers.

"Based on the background description above, this research aims to find out whether lemongrass, kaffir lime and lemon aromatherapy massage has an effect on increasing appetite, IGF-1 levels, body weight and height in stunted toddlers?"

RESEARCH METHOD

Research Hypothesis

Major Hypothesis

Aromatherapy massage has an effect on increasing appetite, IGF-1 levels, body weight and height in stunted toddlers

Minor Hypothesis

1) Aromatherapy massage has an effect on increasing the appetite of stunted toddlers.
2) Aromatherapy massage has an effect on increasing IGF-1 levels in stunted toddlers.
3) Aromatherapy massage has an effect on increasing the weight of stunted toddlers.
4) Aromatherapy massage has an effect on increasing the height of stunted toddlers.

Types and Research Design

This type of research is experimental research with a true experimental design. The research design used was a pretest-posttest with control group design. This research involved a control group and a treatment group. The description of this research design is:

		Pre-Test	Treatment	Post-Test
R	K1	01	X1	02
	K2	03	X2	04

Figure 1. Research Design

Information :

R :Randomization
K1 : Aromatherapy massage intervention group
K2 : Control group given PMT biscuits
O1&O3 :Initial data measurements in the intervention group and control group were for the variables appetite, IGF-1 levels, weight and TB
O2&O4 : Final group data measurementintervention and control groups after being given treatment on the variables of appetite, IGF-1 levels, BW and TB
X1 :Aromatherapy massage treatment in the intervention group
X2 : Treatmentgiving PMT biscuits to the control group

Population and Sample

Population

The population in this study were all stunted toddlers in wworking area of the Tanjung Paku Community Health Center, Solok City, West Sumatra Province.

Sample

The sampling technique in this research is probability sampling, namely simple random sampling. Based on the formula calculation above by estimating the proportion of respondents who dropped out, the total sample size for this study, including the number of drop out samples, was 32 respondents, consisting of 16 people in the intervention group and 16 people in the control group.

Data Processing and Analysis Techniques

Data Processing Techniques

Data processing in research is carried out in the following stages:

1) Editing
   Editing is an effort to re-check the correctness of the data obtained. If there is incomplete information, the researcher asks respondents to complete the data.
2) Coding
   Provide codes according to respondents' answers to facilitate data analysis and processing
3) Tabulating
   Tabulatingis the process of arranging it into table form. At this stage the data is considered to have been processed so that it is arranged into a format that has been designed to make it easier for researchers to read the data that has been collected.
4) Cleaning
   This stage aims to provide data from several possible data that do not meet the requirements with the help of software.
5) Processing
   Researchers process data using computer programs.

Data analysis

1) Univariate Analysis

Univariate analysis was analyzed by calculating the frequency of the research data results. Based on each variable, it produces descriptive distributions and percentages. The purpose of this data analysis is to describe the characteristics of each variable studied and the data displayed in the analysis is the frequency distribution of data in each group. Then, a characteristic homogeneity analysis was carried out before the intervention to assess whether there were differences in the variance of each group.

2) Bivariate Analysis

Before carrying out bivariate analysis, a data normality test was first carried out as a monitor for bivariate parameters using the Kolmogorov Smirnov test (samples > 50) and Shapiro Wilk (samples < 50). Foranalyze the effectiveness of providing interventions, if data is normally distributed then statistical analysis is done using the parametric Paired T-test. If you get data that is not normally distributed, statistical analysis uses the Wilcoxon test.

RESULTS AND DISCUSSION

Data analysis

Univariate Analysis

Variable Analysis

Table 1. Characteristics of Respondents and Research Subjects

Variable	Intervention Group			Control Group		
	N	%	Mean±SD	N	%	Mean±SD
Mother's Age						
Reproductive	13	81.3		12	75.0	
Risky	3	18.8		4	25.0	
Mother's Education						
SENIOR HIGH SCHOOL	5	31.3		6	37.5	
D3	5	31.3		4	25.0	
S1	5	31.3		6	37.5	
S2	1	6		0	0	
Mother's Job		3				
IRT	5	31.3		7	43.8	
Trade	4	25.0		1	6.3	
Honour	1	6.3		4	25.0	
Private	4	25.0		3	18.8	
Civil servants	2	12.5		1	6.3	
Gender Subject						
Man	8	50.0		8	50.0	
Woman	8	50.0		8	50.0	
Exclusive breastfeeding						
Yes	11	68.8		7	43.8	
No	5	31.3		9	56.3	
BB Born						
<2.5kg	2	12.5		2		
2.5-4kg	13	81.3		14	12.5	
>4 kg	1	6.3		0	87.5	
Appetite			70,937±16,453			72.175±17.56
IGF-1			41,539±12,538			26,973±6,316

The characteristics of the respondents and research subjects can be seen from the table above. For confounding variables, subject characteristics in this study include characteristics based on history of exclusive breastfeeding and birth weight which can be seen in table 2.

Table 2. Frequency Distribution of Confounding Variables for Research Subjects in the Intervention Group and Control Group

Characteristics	Group				*P-value*
	Intervention		Control		
	n	%	n	%	
Exclusive breastfeeding					
Yes	11	68.8	7	43.8	0.377*
No	5	31.3	9	56.3	
Birth Weight					
<2.5kg	1	6.3	2	12.5	
2.5-4 kg	14	87.5	13	81.3	0.107*
>4 kg	1	6.3	1	6.3	

**Chi-Square Test*

Based on table 2, it is shown that the characteristics of respondents based on exclusive breastfeeding show that from the intervention group there were 11 respondents who were given exclusive breast milk (68.8%) while those who were not given exclusive breast milk were 5 people (31.3%), while for the control group there were 7 people. respondents (43.8%) who received exclusive breastfeeding and 9 respondents (56.3%) who did not receive exclusive breastfeeding. From the results of the characteristic homogeneity test based on exclusive breastfeeding, the P-value was 0.377 (P>0.05), which means that there was no difference between the intervention group and the control group. From the characteristics based on birth weight in both groups, the average respondent had a birth weight of 2.5-4 kg, 14 respondents (87.5%) in the intervention and control groups, 13 respondents (81.3%).

From the test results obtained, the P-value was >0.05, indicating that there was no significant difference between the exclusive breastfeeding variable and the baby's birth weight, as the confounding variable was homogeneous so it had no effect on the analysis results.

Normality test

The data normality test used in this research was the Shapiro Wilk test because the number of samples in the study was <50 respondents. Data is considered to be normally distributed if a p-value > 0.05 is obtained, conversely if the p-value is < 0.05 then the data is considered not to be normally distributed. The results of the normality test determine the type of research test that will be used next. The results of the normality test can be seen from the table

Table 3. Results of Appetite Normality Test, IGF-1, BB, TB Intervention Group and Control Group

Variable	Group	*P–value*	Information
Appetite			
Pretest	Intervention	0.004	Abnormal
	Control	0.004	Abnormal
Posttest	Intervention	0,000	Abnormal
	Control	0.046	Abnormal
IGF-1			
Pretest	Intervention	0.076	Normal
	Control	0.079	Normal
Posttest	Intervention	0.644	Normal
	Control	0.218	Normal
BB			
Pretest	Intervention	0.407	Normal

Variable	Group	*P–value*	Information
	Control	0.510	Normal
Posttest	Intervention	0.236	Normal
	Control	0.170	Normal
TB			
Pretest	Intervention	0.756	Normal
	Control	0.816	Normal
Posttest	Intervention	0.531	Normal
	Control	0.877	Normal

The results of statistical tests using the Shapiro Wilk test in table 3 show the pretest and posttest appetite variables in the control and intervention groups obtained a p-value <0.05, which means the data is not normally distributed so the next test that will be used is the non-parametric Wilcoxon test and Mann Whitney. For the IGF-1, BB and TB level variables in the intervention group and control group, both pretest and posttest, the P-value was >0.05, meaning the data was normally distributed, so the next parametric test was Paired T-test and Independent T-test. test.

Bivariate Analysis

Bivariate analysis was carried out to test the differences between two variables, where in the previous stage a data normality test was carried out first and then further tests were carried out for paired and unpaired variables.

1) Differences in Appetite Before and After Treatment in the Intervention Group and Control Group

Table 4. Differences in Appetite Before and After Treatment in the Intervention Group and Control Group

Variable	Data	Group		*P-value*
		Intervention	Control	
		Mean±SD	*Mean±SD*	
Appetite	Pretest	70.94 ± 16.45	73.75±16.48	0.669**
	Posttest	12.50±15.81	60.31 ± 23.05	0,000**
	ΔMean	-58.4	-13.44	
P-value		0.001*	0.100*	0.001*

[a]*Wilcoxon sign rank, *level of significance sig <0.05*

[b]*Mann-Whitney, **level of significance sig <0.05*

Based on table 4, it shows the average remaining meal in the pretest intervention group was 70.94 and posttest 12.50. The explanation of this figure is that in the intervention group before being given treatment (pretest) the average remaining food was 70.94 and after being given treatment (posttest) the remaining food decreased to an average of 12.50. In the sense that less food is left over, in other words, more food is used up after being given treatment. In the control group, the average remaining food was 73.75 at pretest and in the posttest the average remaining food was 60.31.

The Wilcoxon test was carried out to determine the difference in pre and post averages in the intervention group and control group. Based on the statistical test output, it is known that Asymp. The sign (2-tailed) for the intervention group is 0.001, because the value 0.001 is smaller than <0.05, it can be concluded that the hypothesis is accepted. This means that in the intervention group there was a difference between the appetite of the pre-test and post-test groups. Meanwhile, the control group showed the Asymp value. Sign (2-tailed) 0.100>0.05 which means that there is no significant difference in the control group before and after being given treatment.

The Mann-Whitney test was carried out to determine whether there was a difference in the average appetite between the intervention group and the control group after being given treatment. Based on the statistical test output, it was found that Asymp. Sign (2-tailed) is 0.000 (<0.05). It can be concluded that there is a difference in appetite between the intervention group and the control group. Because there is a significant difference, it can be said that there is an influence of aromatherapy massage treatment on appetite in stunted toddlers.

Meanwhile, the difference in average appetite in the intervention group and the control group before treatment was found to be Asymp. Sign (2-tailed) is 0.669 (>0.05). It can be concluded that there was no difference in appetite between the intervention group and the control group before being given aromatherapy massage treatment.

2) Differences in Insulin-like Growth Factor 1 (IGF-1) Levels Before and After Treatment in the Intervention Group and Control Group

Table 5. Differences in Insulin-like Growth Factor 1 (IGF-1) Levels Before and After Treatment in the Intervention Group and Control Group

Variable	Data	Group		*P-value*
		Intervention	Control	
		Mean±SD	*Mean±SD*	
IGF-1	Pretest	41.54±12.53	26.97±6.316	0,000**
	Posttest	67.43±9.680	27.33±6.271	0,000**
	ΔMean	25.89	0.36	
P-value		0,000*	0.074*	0.001*

[a]*Paired T-test, *level of significance sig <0.05*
[b]*Independent T-test, **level of significance sig <0.05*

Paired Samples T-test which was carried out to determine the pre and post differences between the intervention group and the control group is known in the table with the Sig value. (2-tailed) in the intervention group was 0.000 (<0.05), then we can conclude that there is a real difference between IGF-1 levels in the pretest and posttest in the intervention group. In the control group with Sig. (2-tailed) 0.074 which means >0.05, so it can be concluded that there is no difference in IGF-1 levels between the pretest and posttest control group.

Based on table 5, it shows that the results of the pretest measurements showed that the average IGF-1 level in the intervention group was 41.54 and for posttest measurements the average was 67.43, while in the control group the average IGF-1 pretest result was 26.97. and for the posttest, namely 27.33. The difference in mean IGF-1 in the control and intervention groups can be seen in the graph below:

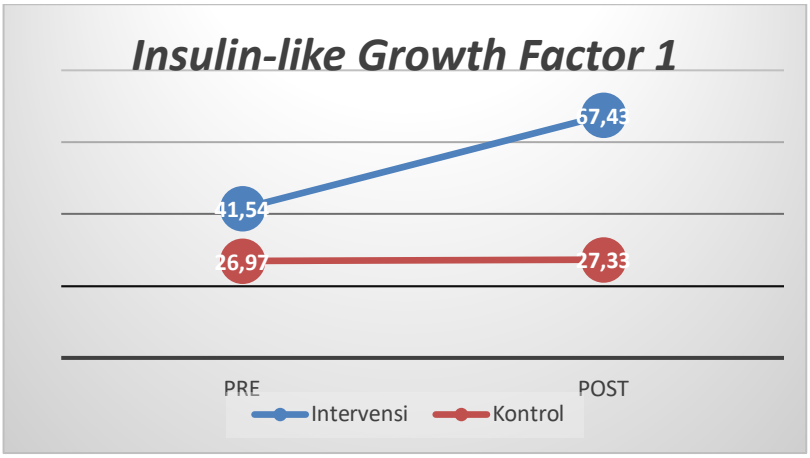

Figure 2. Changes in Mean IGF-1 Pretest and Posttest in the Intervention Group and Control Group

Figure 2 shows that in the intervention group there was an increase in the average IGF-1 before and after treatment, while in the control group the average IGF-1 also increased, before and after treatment, but not as much as the increase in the intervention group.

The results of the Independent T-test were carried out to determine whether there was a difference in the average between the intervention group and the control group after being given treatment. The statistical test results in table 4.4 show the value of Syg. (2-tailed) of 0.000 (<0.05), which means there is a significant difference between IGF-1 levels between the intervention group and the control group both before and after treatment.

3) Differences in Body Weight (BW) Before and After Treatment in the Intervention Group and Control Group

Table 6. Differences in Body Weight (BW) Before and After Treatment in the Intervention Group and Control Group

Variable	Data	Group		*P-value*
		Intervention	Control	
		Mean±SD	*Mean±SD*	
BB	Pretest	9.65±1.36	9.08±1.41	0.255**
	Posttest	9.87±1.39	9.22 ± 1.31	0.183**
	ΔMean	0.22	0.14	
P-value		0,000*	0.062*	0.001*

[a]*Paired T-test, *level of significance sig <0.05*
[b]*Independent T-test, **level of significance sig <0.05*

Based on the measurement results in table 6 above, the intervention group shows an average pretest weight of 9.65 and an average posttest of 9.87. In the control group, the average pretest BB result was 9.08 and for the posttest it was 9.22. Paired Samples T-test which was carried out to determine the pre and post differences between the intervention group and the control group is known in the table with the Sig value. (2-tailed) in the intervention group was 0.000 (<0.05), so we can conclude that there is a real difference between BB in the pretest and posttest in the intervention group. In the control group with Sig. (2-tailed) 0.062 which means >0.05, so it can be concluded that there is no difference in BW between the pretest and posttest control group.

The results of the Independent T-test were carried out to determine whether there was a difference in the average between the intervention group and the control group after being given treatment. It can be seen from the statistical test results in table 6 that the Syg. (2-tailed) in the intervention group was 0.255 and the control group was 0.183 which means <0.05. It can be said that there is no significant difference in body weight between the intervention group and the control group, either before being given treatment or after being given treatment.

4) Differences in Body Height (TB) Before and After Treatment in the Intervention Group and Control Group

Table 7. Differences in Height (TB) Before and After Treatment in the Intervention Group and Control Group

Variable	Data	Group		*P-value*
		Intervention	Control	
		Mean±SD	*Mean±SD*	
TB	Pretest	77.73±4.91	77.02 ± 4.57	0.677**
	Posttest	79.55±5.10	77.53±4.46	0.234**
	ΔMean	1.82	0.51	
P-value		0,000*	0,000*	0.001*

[a]*Paired T-test, *level of significance sig <0.05*
[b]*Independent T-test, **level of significance sig <0.05*

The table above shows the results in the TB intervention group with a pretest average of 77.73 and a posttest average of 79.55. For the control group, the average TB pretest result was 77.02 and for the posttest it was 77.53. Paired Samples T-test which was carried out to determine the pre and post differences between the intervention group and the control group, can be seen in the table with the Sig value. (2-tailed) in the intervention group and control group is 0.000 (<0.05), so we can conclude that there is a real difference between TB in the pretest and posttest in the intervention group and control group.

The results of the Independent T-test were carried out to determine whether there was a difference in the average between the intervention group and the control group after being given treatment. It can be seen from the statistical test results in table 7 that the Syg. (2-tailed) in the intervention group was 0.677 and the control group was 0.243 which means <0.05. It can be said

that there is no significant difference in TB between the intervention group and the control group, either before being given treatment or after being given treatment.

5) Effectiveness of Giving Aromatherapy Massage*Lemongrass, Kaffir Lime,* and Lemon on Increased Appetite, IGF-1, BB, and TB in Stunting Toddlers

The intervention group was the group that received aromatherapy massage treatment 3 times a week with a massage duration of 15 minutes for 8 weeks. Apart from that, the intervention group also received standard treatment for stunting toddlers, namely giving PMT biscuits. Meanwhile, the control group only received PMT biscuits.

In this case, we can see the effectiveness of giving aromatherapy massage in increasing appetite, IGF-1 levels, body weight and height in stunted toddlers compared to edited toddlers who only received standard treatment, namely PMT biscuits. We can know this from comparing the means of the intervention group and the control group after being given treatment, using the effectiveness formula below.

$$Effectivity = \frac{\text{intervention posttest mean} - \text{control posttest mean}}{\text{control posttest mean}} \text{x } 100\%$$

Table 8. Effectiveness of Providing Aromatherapy Massage Compared to Standard Care for Stunting Toddlers Providing PMT Biscuits

Variable	Posttest Mean Intervention	Posttest Mean Control	Effectiveness (%)
Appetite	12.50	60.31	4.78
IGF-1	67.43	27.33	4,010
Weight	9.87	9.22	65
Height	79.55	77.53	200

From table 8 above which measures the effectiveness of giving aromatherapy massage in increasing appetite, IGF-1 levels, body weight and height in stunted toddlers compared to edited toddlers who only received standard treatment, namely giving PMT biscuits, it can be seen that giving aromatherapy massage is proven. statistically effective compared to standard care for pregnant toddlers in the form of giving PMT bisuits.

DISCUSSION

Influenceof Providing Lemongrass, Kaffir Lime, and Lemon Aromatherapy Massage to Increase Appetite in Stunting Toddlers Before and After Treatment

Based on the results of data analysis,The average appetite in the pretest intervention group was 70.94 and posttest 12.50, while in the control group the average appetite was 73.75 at pretest and posttest 60.31. The results of the difference test using the Wilcoxon test in the intervention group showed a P-value of 0.001<0.05, which means that there was a significant difference in the intervention group regarding the increase in appetite before and after being given treatment.So it can be concluded that there is an influence of aromatherapy massage treatment on appetite in stunted toddlers.Meanwhile, the control group showed a P-value of 0.100>0.05, which means that there was no significant difference in the control group before and after being given treatment.

Based on the test results using Mann-Whitney on the appetite pretest, a p-value of 0.622 (>0.05) was obtained, which means that there was no significant difference in appetite between the intervention group and the control group before treatment was given. In the posttest data, a P-value of 0.000<0.05 was obtained, which means there was a significant difference in the intervention group and the control group after being given treatment.

Stunting isthe problem of chronic malnutrition due to a lack of nutritional intake over a long period of time. Stunting must be considered by treating it as early as possible because it has an impact on the level of intelligence, productivity and body immunity to disease, which

in turn can hamper economic growth thereby increasing poverty and inequality which have long-term effects on sufferers, their families and the country (Rahmah et al., 2023).

The Ministry of Health defines stunting as a height index for age (TB/U) of less than minus two standard deviations (-2SD) or below the existing standard average and severe stunting is defined as less than -3SD. Multidimensional factors are thought to be factors that influence the incidence of stunting. Apart from that, poor nutrition experienced by pregnant women and toddlers also contributes to stunting in toddlers. Poor parenting practices, lack of maternal knowledge regarding health and nutrition, limited health services including pregnancy check-up/ANC services, lack of household/family access to nutritious food and lack of access to clean water and sanitation (Nurhidayati et al., 2020).

A good appetite needs to be developed from an early age so that eating disorders do not arise later in life. Toddlers whose eating patterns are disturbed have an impact on their health, making them susceptible to disease. One way to prevent this is by giving massage to toddlers. Massage is a direct contact touch therapy with the body that can provide a feeling of safety and comfort. If massage is done regularly, it will increase catecholamine hormones (epinephrine and norepinephrine) which can stimulate growth and development because they can increase appetite, increase body weight, and stimulate the development of brain structure and function (Simanungkalit, 2020).

The results of Simanungkalit's research on 15 children aged 1 year showed thatThere is a significant influence on the level of difficulty in eating toddlers before and after massage. After the massage, 13 respondents (86.7%) had no difficulty eating and only 2 respondents (13.3%) still had difficulty eating. This shows that there is an effect of massage on increasing the appetite of toddlers aged 1 year (Simanungkalit, 2020)**.**

Giving PMT biscuits to the control group did not have a significant effect on children's appetite. This is supported by research by Ibrahim, et al. Giving additional food (PMT) biscuits is not able to change the nutritional status of toddlers as shown byThe average Zscore value is still at <-2 SD, indicating that children under five are still in the malnourished category because children under five in both the intervention group and the control group prefer outside snacks and do not finish the biscuits given because their appetite has decreased.

Influence of Providing Lemongrass, Kaffir Lime, and Lemon Aromatherapy Massage to Increase IGF-1 Levels in Stunting Toddlers Before and After Treatment

Based on the results of data analysis, the results of the pretest measurements showed that the average IGF-1 level in the intervention group was 41.54 and for posttest measurements the average was 67.43. Meanwhile, in the control group, the average IGF-1 pretest result was 26.97 and for the posttest it was 27.33. The results of data analysis showed that in the intervention group there was an increase in the average IGF-1 before and after treatment, while in the control group the average IGF-1 also increased, before and after treatment, but not as much as the increase in the intervention group.

The results of the test for the influence of paired variable data using the Paired T Test statistical test on the IGF-1 level variable show that the p-value in the experimental group and control groupin the intervention group, a p-value of 0.000 was obtained, which means that there was a significant difference before and after being given treatment. Meanwhile, in the control group, a p-value was obtained of 0.074, which means that there was no significant difference before and after being given treatment.

The results of the Independent T Test in the pretest showed a P-value of 0.160 (<0.05), which means there was no significant difference in the increase in IGF-1 between the

intervention group and the control group. Meanwhile, the P-value in the posttest data is 0.000 <0.05, which means that there is a significant difference in the intervention group and the control group after being given treatment.

IGF-1 is a hormone produced by the liver and other tissues in response to stimulation from GH which functions to influence the growth and development of bones and skeletal muscles. The effects of GH on growth depend on the interaction between growth hormone and IGF-1. The IGF-1 hormone plays a role in regulating postnatal growth in babies from late infancy onwards (Sinaga et al., 2018). Massage is a therapy that can increase IGF-1 levels. The mechanism of massage is that it can increase insulin and IGF-1. Insulin promotes the conversion of glucose to short-term (glucogen) and long-term (lipid) storage, and IGF-1 plays an important role in promoting growth by stimulating cell growth and multiplication as well as inhibiting apoptosis (Yuyun, 2021). The hormone insulin (IGF-1) plays a regulatory role and overall cell metabolism in the human body. IGF-1 is produced by the liver under growth hormone stimulation and has systemic growth effects.

Based on the results of research by Sudarmi, et al on 48 babies aged 6-12 months, it showed that there was a significant difference in IGF-1 levels between the intervention and control groups. The average IGF value in the intervention group before the intervention was 1.377 and after it was 2.573, there was an increase in the average IGF-1 value of 1.19, the results of statistical analysis using the paired t test showed a significant increase of p=0.003 (p<0.05), whereas in the control group before it was 1.74 and after 4.29 there was an increase of 2.55 indicating a significant increase of p<0.001 (p<0.05). The intervention group and control group showed significant differences indicating that infant massage could increase IGF-1 levels (Sudarmi et al., 2020).

The intervention group received massage, which showed that baby massage could increase IGF-1 levels. Massage can stimulate the vagal nerve (one of 12 cranial nerves in the brain) which causes increased vagal activity and increases gastric motility (movement of the digestive tract) and the release of insulin (food absorption hormone) and IGF-1 which play an important role in stimulating growth (Sudarmi et al., 2020).

*Lemongrass*is a type of spice plant, usually used as a cooking spice and medicine. This plant has a shape resembling grass, in many clumps, with very deep and strong roots. The main ingredients of lemongrass essential oil are citronellal, citronellol and geraniol. The citronellol content has biological effects such as analgesic, calming/sedative, hypotensive properties, reduces inflammation, infection, as an antioxidant, stomokic, antipyretic, and stimulates relaxation reactions in the body (Selvita, 2020).

Traditionally the fruit, leaves and bark of Citrus hystrix are the parts most commonly used to reduce the severity of certain diseases. The fruit is used to treat stomach aches by the tribes of hilly Tripura in North East India (Md Othman et al., 2016). While the leaves and fruit are both used to steam baths for postpartum mothers, to relieve headaches, rheumatism, fever and to treat diabetes mellitus, used to improve sexual performance and to treat hypertension, heart disease and diarrhea (Das et al., 2009; Siti et al., 2022). The fruit is used in hair shampoo to reduce dandruff and increase hair growth (Silalahi, 2018).

Lemon essential oil, extracted from lemons, has been used to treat various pathological diseases, such as diabetes, inflammation, cardiovascular disease, depression, and hepatobiliary dysfunction. Several randomized, double-blind, placebo-controlled trials have also revealed anxiolytic-like effects in humans with lemon extract. Its health-related biological activities are not only related to Vitamin C but are also related to flavonoids with anti-allergic, antioxidant, anti-inflammatory, anti-cancer and anti-carcinogenic actions. Recent pharmacological studies also reveal that members of the genus typically express several monoterpenes that impart a

"lemon" taste and odor notably, linalool, limonene, pinene, myrcene, eriodictyol and their derivatives, as well as some of the more typical monoterpenes expressed by related genera. Monoterpene factors may have some effects directly related to brain function, including: cholinesterase inhibitory activity by essential oils. Monoterpenes exert emotional influencing activity by directly acting on the olfactory nerves and the central nervous system (Ben Hsouna et al., 2017; EM Mustafa, 2015).

Journal of Pediatric Nursing (2016) in one of their publications mentioned the efficacy and safety of using oil in massage to increase baby growth. Research shows that massage using oil can increase a baby's weight, body length and head circumference. In conclusion, massage using oil effectively increases the baby's physical growth (Saidah & Dewi, 2020).

Aromatherapy can be given by inhaling, compressing, applying to the skin, spraying, or mixing it with water to soak the whole body or certain parts of the body. Massaging will make it work better (Li et al., 2016). In the massage process with aromatherapy, aromatherapy stimulates the central nervous system through the distribution of molecules that spread aroma, so it is useful for treatment and relaxation (Nirnasari, 2021; Minister of Health Regulation No. 8 of 2014 concerning SPA Health Services [JDIH BPK RI], 2014).

Nutritional factors are related to stunting, and other conditions such as genetics, hormones, as well as psychosocial environmental factors can contribute to growth disorders (Almaitser, 2017). According to the Ministry of Villages, Development of Disadvantaged Regions and Transmigration, stunting in children under five is included in chronic malnutrition caused by several factors, including socio-economic conditions, nutrition of pregnant women, infant morbidity rates, and inadequate nutritional intake of infants (Remarks et al., n.d.).

In line with Aditiawati's statement that child development is a process in which various factors, including hormonal, psychosocial and environmental factors, especially nutrition, interact with each other (Aditiawati, 2019). The impact of stunting is closely related to impaired appetite and growth. Appetite is the desire to eat and choose food according to what is desired. During the toddler period, the child's appetite begins to be erratic and difficult to predict, resulting in the child's appetite decreasing (Almaitser, 2017).

Influence of Providing Lemongrass, Kaffir Lime, and Lemon Aromatherapy Massage on Increased Body Weight (BB) in Stunting Toddlers Before and After Treatment

Based on the results of data analysis, the pretest measurement results obtained in the intervention group were 9.65 and for the posttest measurements the mean was 9.87 with a P-value of 0.000. Meanwhile, in the control group, the average pretest BB result was 9.08 and for the posttest it was 9.22 with a P-value of 0.062. The results of data analysis showed that in the intervention group there was an increase in mean body weight before and after treatment, whereas in the control group there was no difference in mean weight between before and after treatment.

The results of the test for the influence of paired variable data using the Paired T-test statistical test on the weight variable show that the P-value in the experimental group and control groupin the intervention group, the P-value was 0.000, which means that there was a real difference between body weight before and after treatment. Meanwhile, in the control group, a p-value was obtained of 0.062, which means that there was no real difference before and after being given treatment.

The results of the Independent T-test in the intervention group showed a P-value of 0.255 (<0.05), while the P-value in the posttest data was 0.183 (<0.05), which means there was no significant difference in weight between the intervention group and control group.

One of the factors that influences a child's growth and development is stimulation, one of which is touch in the form of massage. Massage can have positive physical effects, including increasing growth and influencing body weight. Children who are massaged well and regularly can grow healthier and develop better. This is because beta endorphin influences the growth mechanism. Babies who are massaged experience an increase in vagus nerve tone which will cause an increase in enzyme levels for better food absorption (Maharani et al., 2017).

Weight gain is of course greatly influenced by ongoing massage. Basically, toddlers who are massaged will experience an increase in the levels of absorption enzymes and insulin so that the absorption of food essence becomes better. As a result, toddlers become hungry quickly and increase their appetite (Massage et al., 2022).

There are several factors that can influence the increase in weight of toddlers, including child psychology, mother's knowledge about nutrition, health status, as well as personal factors and preferences. Socioeconomic status and food culture have a big responsibility for the health status of children under five. In particular, this research proves that giving massage to toddlers can help optimize toddler growth by increasing the toddler's weight (Kamariah & Damayanti, 2023).

This research is supported by research conducted by Laska et al (2022) which states that there is an effect of giving massage on weight gain in stunted toddlers. Massage for toddlers will improve the function of the digestive system, especially in the absorption of food essences so that body weight will increase as expected (Knowledge et al., 2022).

In line with research conducted by Freya Nazera Iskandar on premature babies, it was stated that stimulation in the form of touch, known as kinesthetic tactile, then given 2 times a day for 3 days with a duration of 15 minutes, was effective in increasing the weight of premature babies (Iskandar et al., 2019). As we know, massage is a form of stimulation using the touch method. This research is also supported by research conducted by Agrystina Ryma Melati who examined the effect of spa on baby's weight, where in spa there are 2 components, namely swimming and massage, stating that giving spa 2 times a week significantly increases baby's weight (Agrystina, 2017).

Influence of Giving Lemongrass, Kaffir Lime, and Lemon Aromatherapy Massage to Increase Height (TB) in Stunting Toddlers Before and After Treatment

Based on the results of data analysis, the results of the pretest measurements showed that the average height in the intervention group was 77.73 and for the posttest measurements the average was 79.55. In the control group, the average height for the pretest was 77.05 and for the posttest it was 77.53. The results of data analysis showed that in the intervention group there was an increase in the average height before and after treatment and in the control group the average height also increased before and after treatment, but not as much as the increase in the intervention group.

The results of the test for the influence of paired variable data using the Paired T-test statistical test on the height variable show the P-value in the groupsThe pretest and posttest interventions obtained a P-value of 0.000, which means that there was a significant difference before and after the treatment was given. In the pretest and posttest control groups, a P-value of 0.000 was obtained, which means that there was a significant difference before and after being given treatment.

The results of the Independent T-test on the pretest showed a P-value of 0.000 (<0.05), which means there was a significant difference in the increase in height between the intervention group and the control group. Meanwhile, the P-value in the posttest data is 0.000

<0.05, which means that there is a significant difference in the intervention group and the control group after being given treatment.

Height is one part of a child's growth. Growth is an increase in a person's physical size that can be observed and lasts from birth to adulthood. To find out a child's growth, you need to measure your height every month. At infant age, children's growth rate is very rapid, but this does not happen to stunted children. The average length of a baby at 1 year old is 1.5 times the length at birth, if it does not meet the standards the child is categorized as stunting.

The impact of stunting also affects body height. To increase the height of stunted babies, of course, therapeutic efforts such as baby massage are needed. Baby massage will improve the function of the digestive system, especially in the absorption of food essences so that height will increase along with weight gain. This is in line with research by Prastiwi and Alindawati in 2022 which stated that baby massage has an effect on increasing weight and height, although the results are different from giving baby spa.

Effectiveness of Giving Aromatherapy Massage*Lemongrass, Kaffir Lime,* and Lemon on Increased Appetite, IGF-1, BB, and TB in Stunting Toddlers

Based on the results of calculations assessing the effectiveness of aromatherapy massage treatment 3 times a week for 15 minutes for 8 weeks in stunted toddlers compared to standard care for stunted toddlers in the form of giving PMT biscuits, in increasing appetite, IGF-1 levels, body weight and height, it was found that massage Aromatherapy is effective in increasing appetite, IGF-1 levels, body weight and height in stunted toddlers compared to just giving PMT biscuits alone.

The effectiveness of aromatherapy massage in increasing appetite was found to be 4.78% more effective than standard care of giving PMT biscuits. For IGF-1 levels the effectiveness was 4,010%, for the weight variable the treatment effectiveness was 65%, and for the height variable the effectiveness of aromatherapy massage was 200% compared to standard care for stunting toddlers in the form of giving PMT biscuits.

Stunting is a child's growth that is disturbed, namely the child's height is lower/shorter than his age and stunting that occurs in toddlers is an indicator of chronic malnutrition. 27 Stunting is a serious condition when children do not receive good nutritious food in the right amount and for a long time.The impact of stunting is closely related to appetite and growth disorders.

One important clinical disorder that is often experienced by children but is often ignored is appetite disorders. When the desire to eat is less strong than before or is caused by a certain condition, disease or other disorder, this is called decreased appetite. It is believed that decreased appetite is the main cause of malnutrition and can affect weight loss (Hermina & Prihatini, 2016).

Massage is a traditional childcare practice that has survived to this day because its efficacy has been proven. Our ancestors were accustomed to massaging babies when there were health problems indicated by symptoms of fussiness, flatulence and not wanting to eat (Massage et al., 2022).

Aromatherapy is an alternative therapy known as complementary therapy and is a legacy from ancient times. Aroma therapyIt is claimed to be able to improve the psychological and physical well-being of babies. Several types of aroma therapy that can be used to increase appetite, IGF-1, BB and TB are lemongrass, kaffir lime and lemon. This type of aromatherapy provides a calming/sedative effect and stimulates a relaxation reaction in the body.

Aromatherapy can be given by inhaling, compressing, applying to the skin, spraying, or mixing it with water to soak the whole body or certain parts of the body. Massaging will make it work better (Li et al., 2016). In the aromatherapy massage process, aromatherapy stimulates the central nervous system through the distribution of molecules that spread aroma, so it is useful for treatment and relaxation.

Massage using oil can increase the baby's weight, body length and head circumference. In conclusion, massage using oil effectively increases the baby's physical growth (Saidah & Dewi, 2020). This is in line with this research, where a significant difference was found in the increase in toddlers' appetite before and after being given Lemongrass, Kaffir Lime and Lemon aromatherapy massage.

Massage will increase the mechanism of food absorption by the vagus nerve so that the child's appetite will increase and can directly increase the child's weight and height. Based on research by researchers and previous research, it was found that massage therapy using aromatherapy can have an influence on appetite, IGF-1, weight and height of toddlers.

CONCLUSION

As a result of the analysis and discussion that has been described, the conclusion of this research is that there is an influence of the intervention of providing lemongrass, kaffir lime and lemon aromatherapy massage on increasing appetite and IGF-1 levels in stunted toddlers, so the conclusion can be described as follows:

1. Lemongrass, kaffir lime and lemon aromatherapy massage had an effect on increasing appetite in stunted toddlers compared to the control group, proven statistically and significant with a P-value of 0.000.
2. Lemongrass, kaffir lime and lemon aromatherapy massage had an effect on increasing IGF-1 levels in stunted toddlers compared to the control group. This was proven statistically and significant with a P-value of 0.000.
3. Lemongrass, kaffir lime and lemon aromatherapy massage showed that the P-value of appetite in the intervention group using the Wilcoxon test showed a P-value of $0.001 < 0.05$, which means that there was a significant difference in the intervention group in terms of increasing appetite before and after it was given. treatment.
4. Lemongrass, kaffir lime and lemon aromatherapy massage showed that the average IGF-1 level in the pretest intervention group was 41.54 and for posttest measurements the average was 67.43. The test results using the Paired T-test in the intervention group showed a P-value of 0.000, which means that there was a significant difference in IGF-1 levels before and after treatment.
5. Lemongrass, kaffir lime and lemon aromatherapy massage using the Paired T-test statistical test showed that the average body weight in the pretest intervention group was 9.65 and for the posttest measurement the average was 9.87. The test results using the Paired T-test in the intervention group obtained a P-value of 0.000, it can be concluded that there was a significant difference before and after being given treatment.
6. Lemongrass, kaffir lime and lemon aromatherapy massage showed that the average height in the pretest intervention group was 77.73 and for the posttest measurement the average was 79.55. In the control group the pretest average was 77.02 and posttest 77.53. The test results used the Paired T test, in the intervention group and control group, a P-value of 0.000 was obtained, which means that there was a significant difference before and after being given treatment in the intervention group and also in the control group.
7. Aromatherapy massage of lemongrass, kaffir lime, and lemon through the posttest effectiveness test (after treatment) in the intervention group with the control seen from the

mean difference, it was found that aromatherapy massage compared to standard care for stunted toddlers, namely giving PMT biscuits, was effective in increasing appetite, IGF-1 levels, body weight and height with effectiveness of 4.78%, 4,010%, 65% and 200% respectively.

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