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THE EFFECTIVENESS OF HERBAL SUPPLEMENTS ON IMPROVING THE ANTHROPOMETRIC STATUS OF STUNTED CHILDREN

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ABSTRACT

Stunting has become a health issue that threatens the future generation of Indonesia, which is why the government has set a target prevalence of stunting at 14% by 2024. This has become a challenge because some areas, such as Sorong Regency, still have a higher prevalence of stunting compared to the national prevalence. One of the causes of stunting is malnutrition, so efforts are needed to address this issue by utilizing Indonesia's natural wealth, such as herbal honey, *Curcuma xanthorrhiza*, and black cumin, which are widely used by the community to tackle various health problems. The objective is to determine the effect of administering herbal honey made from temulawak and black cumin on changes in the anthropometric status of stunted children in Sorong Regency. This type of research is quantitative, using a quasi-experimental research design with a pre- and post-test with a control group design. The sampling technique used is purposive sampling, with a total sample of 60 children divided into 3 groups: the normal control group (20 children), the stunting control group (20 children), and the stunting intervention group (20 children). The data analysis techniques used in the research are paired-samples t-test and independent-samples t-test. The statistical test of the mean difference between the pre- and post-test between the intervention group and the control group showed a significant increase in body weight (average increase of 1.60 ± 0.66 kg, $p < 0.001$), height (1.49 ± 0.74 cm, $p < 0.001$), and z-score height-for-age (-0.42 ± 0.22 SD, $p < 0.001$). The administration of herbal honey, *Curcuma xanthorrhiza*, and black cumin can improve the anthropometric status of stunted children in Sorong Regency.

Kata Kunci:

Stunting;
Madu herbal;
Temulawak;
Jintan hitam

ABSTRAK

Stunting menjadi masalah kesehatan yang mengancam generasi bangsa Indonesia, oleh karena itu pemerintah menetapkan target prevalensi stunting sebesar 14% pada tahun 2024. Hal ini menjadi suatu tantangan karena beberapa wilayah seperti Kabupaten Sorong masih memiliki prevalensi stunting yang lebih tinggi dibandingkan prevalensi Nasional. Salah satu penyebab stunting adalah malnutrisi, sehingga perlu upaya untuk mengatasi persoalan ini dengan memanfaatkan potensi kekayaan alam Indonesia seperti madu, temulawak, dan jintan hitam yang banyak dimanfaatkan oleh masyarakat untuk mengatasi berbagai masalah kesehatan. Penelitian ini bertujuan untuk mengetahui pengaruh pemberian madu herbal temulawak-jintan hitam terhadap perubahan status antropometri anak stunting di Kabupaten Sorong. Jenis penelitian ini adalah penelitian kuantitatif, menggunakan desain penelitian quasy eksperimental dengan desain pre and post-test with control group. Teknik sampling yang digunakan ialah purposive sampling, total sampel sebanyak 60 anak yang terbagi menjadi 3 kelompok, yaitu kelompok normal kontrol (20 anak), kelompok stunting kontrol (20 anak), dan kelompok stunting intervensi (20 anak). Teknik analisa data hasil penelitian yang digunakan ialah paired-samples t-test dan independent-samples t-test. Uji statistic perbedaan rerata selisih pre and post-test antara kelompok intervensi dengan kelompok kontrol menunjukkan peningkatan berat badan yang signifikan (peningkatan rata-rata 1,60 kg ± 0,66 kg, p<0,001), tinggi badan (1,49 cm ± 0,74 cm, p<0,001), dan z-score height-for-age (-0,42 SD ± 0,22 SD, p<0,001). Pemberian madu herbal temulawak-jintan hitam dapat memperbaiki status antropometri anak stunting di Kabupaten Sorong.

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INTRODUCTION

Stunting is a condition where a child experiences growth impairment due to chronic malnutrition over an extended period, resulting in a height that is not appropriate for their age. According to the Ministry of Health of the Republic of Indonesia, the category of stunted children is classified based on the height-for-age z-score, which includes short (z-score less than -2 SD) and very short (z-score less than -3 SD) categories (PerMenKes R. I., 2020). Based on the results of the 2022 Indonesian Nutrition Status Survey (SSGI), West Papua Province ranks sixth among the provinces with the highest prevalence of stunted toddlers in Indonesia, with a prevalence of 30%, which is above the national rate of 21.6%. Among the 13 districts/cities in West Papua Province, Sorong Regency ranks second as the area with the lowest prevalence of stunted toddlers (23.8%) (Kemenkes RI, 2022), Although Sorong Regency is ranked second lowest in terms of stunting prevalence among toddlers in West Papua Province, a prevalence of 23.8% is still considered high, especially considering Indonesia's national target of 14% stunting prevalence by 2024 as stated in the 2021 Presidential Regulation on the Acceleration of Stunting Reduction (Kemenkes RI, 2022; PerPres RI, 2021). The issue of stunting is not merely about suboptimal physical growth and development; its impacts are far-reaching and detrimental, including impaired cognitive development, increased susceptibility to illness in childhood, reduced productivity in adulthood, and a decline in the overall quality of human resources. Several factors contribute to the occurrence of stunting, including direct causes such as malnutrition and infectious diseases (Flora, 2021; Siahaan et al., 2023; Sutarto et al., 2018). Indirect contributing factors include inappropriate parenting practices, limited access to healthcare services, and poor environmental sanitation and hygiene (Candra, 2020; De Onis & Branca, 2016).

The simplest method to monitor children's growth and development is through anthropometric indicators, specifically weight, height, height-for-age z-score, and weight-for-age z-score (Triawanti et al., 2018). A child's poor anthropometric status is often the result of inadequate nutritional and protein intake, leading to stunted growth (Akrom, Hidayati, Kencana, et al., 2022). Poor nutritional status is a major determinant of stunting (Masluhiya & Soares, 2023; Yuningsih, 2022) because malnutrition can suppress the production of growth hormones, disrupt immune function, increase susceptibility to infection, and trigger oxidative stress that inhibits growth in children (Chabibi et al., 2017; Flora, 2021; Hu et al., 2022; Zhang et al., 2017). To address nutritional problems in children, one alternative approach is to utilize Indonesia's abundant natural resources, such as honey, *Curcuma xanthorrhiza* (temulawak), and black cumin, which are widely believed to offer various health benefits. Studies on the effect of honey supplementation on the nutritional status of stunted children have been reported. For instance, research on forest honey in Kampar Regency, Riau Province, showed that it improved height-for-age z-scores in stunted toddlers, although no changes were found in weight-for-age scores (Paramita et al., 2021). Another study at the Lopok Health Center in Sumbawa Regency found that giving Sumbawa honey to undernourished toddlers improved weight-for-height z-scores.

However, most existing research is limited to the effects of honey as a single preparation, with varied outcomes and limited assessment parameters. Studies on the combination of honey, *Curcuma xanthorrhiza*, and black cumin in improving the nutritional status of stunted children remain scarce. Nevertheless, this combination has been formulated and tested for its antioxidant and immunomodulatory properties. Akrom et al. (2022) reported that a combination of black cumin seed and *Curcuma xanthorrhiza* extract contained 4% thymoquinone, 25.87 mg/ml of polyphenols, 41.86 mg/dl of flavonoids, as well as high levels of vitamins and minerals. This formulation exhibited strong antioxidant activity, increased TNF-α expression, and decreased IL-10 levels (Akrom, Hidayati, Umam, et al., 2022). Another study (Hidayati et al., 2023) found that the combination of *Curcuma xanthorrhiza* (CX), black cumin seed (BC), and honey exhibited chemopreventive, antioxidant, and immunomodulatory activities in animal models. Our previous research evaluating a combination of herbal honey, *Curcuma xanthorrhiza*, and black cumin as an antioxidant supplement for stunting prevention showed that the formulation had a higher viscosity and lower pH than commercial honey but still met safety standards. It was free of heavy metal contamination and contained beneficial polyphenols. Furthermore, the antioxidant activity of this combination was relatively high, with an IC_{50} of 54.78 ppm (Hardia et al., 2025).

The polyphenol content and antioxidant activity of the combined herbal honey, *Curcuma xanthorrhiza*, and black cumin are believed to improve the anthropometric status of stunted children by preventing oxidative stress and promoting the growth of healthy gut microbiota, thereby enhancing nutrient absorption. The addition of honey as a solvent and sweetener can also mask the strong taste and aroma of

Curcuma xanthorrhiza and black cumin, which often cause discomfort such as burping, making the supplement more palatable for children (Aljohar et al., 2018; Khan et al., 2018). Therefore, a preparation containing honey, *Curcuma xanthorrhiza*, and black cumin with high thymoquinone and curcumin content and a pleasant taste is expected to increase acceptance and efficacy (Cianciosi et al., 2018; Khan et al., 2019). Although this combination has theoretical potential to improve the anthropometric status of stunted children, clinical evidence on its effectiveness is lacking. Therefore, this study aims to determine the effect of consuming a combination of herbal honey, *Curcuma xanthorrhiza*, and black cumin on improving the anthropometric status of stunted children in Sorong Regency.

METHOD

Type of Research

This research is a quantitative study using a quasi-experimental design with a pre- and post-test approach and a control group. A pre-test was conducted on each group, followed by an intervention in the form of a combination of herbal honey, *Curcuma xanthorrhiza*, and black cumin, which was given to the experimental group for three months. After the intervention period, post-test data were collected from all groups. The study was conducted at the Sorong Regency Health Office from November 2022 to March 2023.

Population and Sample

The research was conducted on individuals who met the inclusion criteria from the target population. The total sample consisted of 60 children, divided into three groups: 20 children in the normal control group, 20 children in the stunting control group, and 20 children in the stunting intervention group. The sampling technique used was purposive sampling.

Inclusion criteria included: children aged 24–72 months; children with a height-for-age z-score between -3 SD and less than -2 SD; parents who signed the informed consent form as a statement of willingness for their child to participate as a research subject; and children residing in Aimas District, Sorong Regency, Southwest Papua Province. Exclusion criteria included: children with physical or mental disabilities; parents who did not sign the informed consent; and families who moved to areas inaccessible to the research team.

Intervention

This study consisted of three groups: the normal control group, the stunting control group, and the stunting intervention group. After collecting pre-test data, the stunting intervention group was given three bottles of a combination of herbal honey, *Curcuma xanthorrhiza*, and black cumin for a three-month consumption period per child. The dosage given to the intervention group was 5 mL once daily for 90 days.

The herbal honey, *Curcuma xanthorrhiza*, and black cumin were distributed in stages—one bottle each month in three separate distributions—to monitor the compliance of the study participants. Meanwhile, the stunting control and normal control groups did not receive the intervention during the study period; however, the stunting control group continued to receive nutritional intervention as part of the ongoing government program. The intervention was given to the stunting control and normal control groups only after the researchers had collected post-test data, to avoid bias in the research findings.

Data Analysis and Processing

The data analysis techniques used in this study were the paired-samples t-test and the independent-samples t-test. The paired-samples t-test was used to examine differences between two related or paired samples—specifically the pre-test and post-test results within each group. The independent-samples t-test was used to analyze the difference in mean score changes between the pre-test and post-test of two independent groups (the intervention group and the control group).

Ethical Consideration

This research received ethical approval for human subject research from the Research Ethics Committee of Ahmad Dahlan University (KEP UAD), with approval number: 012206067.

RESULT

The results of this study were analyzed using univariate and bivariate statistical analyses. Univariate analysis was conducted to present the characteristics of the research subjects, as shown in Table 1. Bivariate analysis using the paired-samples t-test was employed to determine the mean differences between pre- and post-tests in each group, as presented in Table 2. Meanwhile, the independent-samples t-test was used to examine the differences in mean changes for each variable between the control group and the intervention group. This allowed the researchers to assess the effect of the combination of herbal honey, *Curcuma xanthorrhiza*, and black cumin on changes in the anthropometric status of stunted children, as shown in Table 3.

Table 1. Frequency Distribution of Respondent Characteristics (n=60)

Characteristic	Groups		
	Normal Control (n=20)	**Stunting Control (n=20)**	**Stunting Intervention (n=20)**
Age of child in months	65.40	64.30	56.65
Gender			
Male, n (%)	9 (45%)	9 (45%)	11 (55%)
Female, n (%)	11 (55%)	11 (55%)	9 (45%)
Body Weight (kg)	18.94 ± 3.69	15.04 ± 3.07	13.32 ± 2.47
Height (cm)	112.64 ± 5.85	95.86 ± 3.38	94.69 ± 4.74
Z-Score Height-for-Age (SD)	0.69 ± 0.99	-2.85 ± 0.53	-2.79 ± 0.12
Z-Score Weight-for-Age (SD)	0.35 ± 1.29	-1.53 ± 1.34	-2.18 ± 1.09

Table 1 presents the demographic characteristics of the three research groups. The height-for-age z-score values in the stunting intervention group (-2.79 SD ± 0.12 SD) and the stunting control group (-2.85 SD ± 0.53 SD) were both below -2 SD, indicating that the children were stunted. The weight-for-age z-score in the stunting intervention group (-2.18 SD ± 1.09 SD) falls into the underweight category (-3 SD to < -2 SD), while the scores in the stunting control group (-1.53 SD ± 1.34 SD) and the normal control group (0.35 SD ± 1.29 SD) fall within the normal category (-2 SD to +1 SD) (PermenKes RI, 2020).

Table 2. The difference in average body weight, height, z-score Height-for-Age, and z-score Weight-for-age of children between pre- and post-test (n=60)

Variables	Groups	n (60)	Pre-test	Post-test	Δ	p-value
Body Weight (kg)	Normal control	20	18.94±3.69	19.56±3.75	0.62±0.35	0.000[a]
	Stunting control	20	15.04±3.07	16.25±2.88	1.21±0.55	0.000[a]
	Stunting intervention	20	13.32±2.47	14.93±2.21	1.60±0.66	0.000[a]
Height (cm)	Normal control	20	112.64±5.85	113.90±5.85	1.26±0.35	0.000[a]
	Stunting control	20	95.86±3.38	97.36±3.15	1.49±0.74	0.000[a]
	Stunting intervention	20	94.69±4.74	97.22±4.32	2.53±1.10	0.000[a]
Z-Score Height-for-Age (SD)	Normal control	20	0.69±0.99	0.72±0.99	0.03±0.91	0.083[a]
	Stunting control	20	-2.85±0.53	-2.77±0.54	-0.08±0.11	0.007[a]
	Stunting intervention	20	-2.79±0.54	-2.37±0.45	-0.42±0.22	0.000[a]
Z-Score Weight-for-Age (SD)	Normal control	20	0.35±1.29	0.43±1.17	0.08±0.66	0.571[a]
	Stunting control	20	-1.53±1.34	-0.94±0.53	-0.59±0.49	0.000[a]
	Stunting intervention	20	-2.18±1.10	-1.33±0.87	-0.85±0.45	0.000[a]

Paired-samples t-test; Statistic significant p<0.05

Table 2 shows the average changes in body weight, height, height-for-age z-score, and weight-for-age z-score of children between the pre-test and post-test in all study groups. All three groups showed significant changes ($p < 0.05$) in nearly all parameters (body weight, height, height-for-age z-score, and weight-for-age z-score), except for the normal control group, in which the increases in height-for-age and weight-for-age z-scores were not statistically significant ($p > 0.05$). Sequentially, the highest improvements in each parameter were observed in the stunting intervention group: body weight (Δ = 1.60 kg ± 0.66 kg),

height (Δ = 2.53 cm ± 1.10 cm), height-for-age z-score (Δ = -0.42 SD ± 0.22 SD), and weight-for-age z-score (Δ = -0.85 SD ± 0.45 SD). The lowest changes occurred in the normal control group: body weight (Δ = 0.62 kg ± 0.35 kg), height (Δ = 1.26 cm ± 0.35 cm), height-for-age z-score (Δ = 0.00 SD ± 0.91 SD), and weight-for-age z-score (Δ = 0.08 SD ± 0.66 SD).

Table 3. The difference in the average pre- and post-test scores between the intervention group and the control group regarding body weight, height, height-for-age z-score, and weight-for-age z-score

Variables		Groups	Δ	p-value
Body Weight (kg)	Stunting intervention - Normal control	Normal control	0.62±0.35	0.000
		Stunting intervention	1.60±0.66	
	Stunting intervention - Stunting control	Stunting control	1.21±0.55	0.049
		Stunting intervention	1.60±0.66	
Height (cm)	Stunting intervention - Normal control	Normal control	1.26±0.35	0.000
		Stunting intervention	2.53±1.10	
	Stunting intervention - Stunting control	Stunting control	1.49±0.74	0.001
		Stunting intervention	2.53±1.10	
Z-Score Height-for-Age (SD)	Stunting intervention - Normal control	Normal control	0.03±0.91	0.038
		Stunting intervention	-0.42±0.22	
	Stunting intervention - Stunting control	Stunting control	-0.08±0.11	<0.001
		Stunting intervention	-0.42±0.22	
Z-Score Weight-for-Age (SD)	Stunting intervention - Normal control	Normal control	0.08±0.66	0.000
		Stunting intervention	-0.85±0.45	
	Stunting intervention - Stunting control	Stunting control	-0.59±0.49	0.053
		Stunting intervention	-0.85±0.45	

Independent-samples t-test; Statistic significant p<0.05

The results of the statistical analysis using the independent-samples t-test are shown in Table 3. The comparison between the stunting intervention group and the control groups (normal control and stunting control) demonstrated that the 3-month intervention with the combination of herbal honey, *Curcuma xanthorrhiza*, and black cumin in the stunting intervention group resulted in greater improvements in body weight, height, and height-for-age z-score than those seen in the groups that did not receive the intervention ($p < 0.05$). However, for the weight-for-age z-score parameter, the difference between the stunting intervention group and the stunting control group was not statistically significant ($p > 0.05$).

DISCUSSION

The nutritional status of children is one of the important factors that influence their growth and development. One of the best methods for assessing nutritional status is through anthropometric measurements, specifically weight-for-age z-score and height-for-age z-score, which reflect imbalances in energy and protein intake. The combination of herbal honey, *Curcuma xanthorrhiza*, and black cumin has emerged as one of the herbal supplement formulations aimed at improving the nutritional status of stunted children, particularly those experiencing nutrient deficiencies, as it contains various active compounds believed to enhance the nutritional status of such children.

Based on the data presented in Table 2 regarding the average increases in body weight, height, height-for-age z-score, and weight-for-age z-score from pre-test to post-test in all three groups, the stunting intervention group showed the highest mean improvements across all parameters compared to both the stunting control and the normal control groups. The results of the paired-samples t-test revealed significant effects ($p < 0.05$) in improving the anthropometric status of stunted children who received the herbal supplement containing honey, *Curcuma xanthorrhiza*, and black cumin, compared to the two control groups. This finding suggests that the nutritional intake in the intervention group was more optimal. These results are further supported by the data in Table 3, where the independent-samples t-test showed significant differences in mean body weight, height, height-for-age z-score, and weight-for-age z-score between children who consumed the herbal combination and those who did not.

The researchers' analysis showed that the three-month intervention with herbal honey, *Curcuma xanthorrhiza*, and black cumin led to improvements in weight, height, and z-scores in malnourished children. While some improvements were also observed in the stunting and normal control groups, likely due to supplementary feeding programs provided by local community health centers, the magnitude of improvement was greater in the stunting intervention group. This indicates that the combination herbal formulation had a positive impact on anthropometric parameters among stunted children.

The observed improvements in weight, height, and z-scores among stunted children receiving the intervention are thought to result from the bioactive compounds present in the combination. Honey contains antioxidant properties that have been observed both in vitro and in vivo, regardless of floral source or geographical origin, due to the presence of vitamin C, phenolic compounds, flavonoids, and β-carotene, which act as potent antioxidants. These phenolic compounds work through mechanisms such as reduction, metal chelation, free radical scavenging, electron donation, and quenching of singlet oxygen formation (Handayani, 2018). Additionally, honey contains high levels of glucose and fructose, which can promote nutrient absorption in the small intestine and help stimulate appetite in children. *Curcuma xanthorrhiza* contains curcuminoids and essential oils, while black cumin is rich in thymoquinone and its derivatives, such as dithymoquinone, thymohydroquinone, and thymol (30–48%), as well as vitamins A, B1, B2, B3, C, and E, along with thiamine, niacin, and pyridoxine (Ardiana, 2022). Thymoquinone and thymohydroquinone, two of the key active compounds in black cumin, are known to reduce calcium ion influx, inhibit mast cell degranulation, and function as immunomodulators that help suppress inflammatory responses (Amanulloh & Krisdayanti, 2019). Furthermore, an animal study using a combination of herbal honey, *Curcuma xanthorrhiza*, and black cumin demonstrated immunomodulatory effects, including increased levels of CD4, CD8, and CD25 lymphocytes (Hidayati et al., 2023). The results of this study align with findings by Renny, F., et al (2010), which showed that administering honey and *Curcuma xanthorrhiza* significantly increased appetite and body weight in toddlers (Renny et al., 2010). Another supporting study by Limidina, R., et al. (2024) found that administration of Zhantorhiza pudding significantly contributed to weight gain among stunted children (Limidina et al., 2024).

CONCLUSION

The consumption of a combination of herbal honey, *Curcuma xanthorrhiza*, and black cumin for three months has been statistically proven to significantly increase body weight, height, and height-for-age z-scores in stunted children in Sorong Regency compared to the control group. Further research is recommended to evaluate the effects of this combination on improving the nutritional status of stunted children using more specific nutritional biomarkers, such as measurements of Insulin-like Growth Factor-1 (IGF-1) levels.

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