THE EFFECT OF GIVING MORINGA LEAF EXTRACT GUMMY AND DATE PALM JUICE ON THE INCREASE IN WEIGHT OF TODDLERS IN KINDERGARTEN DWP 3 MALANG

Lia Oktavia[1*], Anik Sri Purwanti[2], Retno Dewi Prisusanti[3]

[1-3]Program Studi Sarjana Kebidanan, Fakultas Kesehatan, Institut Teknologi, Sains, dan Kesehatan RS dr. Soepraoen, Malang

[*Email Korespondensi: liaokta512@gmail.com]

Abstract: The Effect of Giving Moringa Leaf Extract Gummy and Date Palm Juice on the Increase in Weight of Toddlers in Kindergarten DWP 3 Malang. *Undernutrition during toddlerhood may interfere with optimal growth and development, highlighting the need for acceptable and locally based nutritional interventions. This study aimed to determine the effect of Moringa leaf extract gummy and date palm juice on changes in body weight among underweight toddlers aged 4–5 years at TK DWP 3 Sukodono, Malang Regency. This study employed a pre-experimental one-group pretest–posttest design. Thirty-two underweight toddlers were selected from a population of 35 participants using the Slovin formula and predetermined inclusion and exclusion criteria. Participants received two gummies containing Moringa leaf extract and date palm juice daily for 30 days. Measurements were obtained before and after the intervention using a digital weighing scale. Data were analyzed using the Shapiro–Wilk normality test and Wilcoxon Signed-Rank Test. The mean measurement score changed from 2.00 ± 0.00 before the intervention to 1.38 ± 0.49 after the intervention, representing a mean change of −0.62 points. The Wilcoxon Signed-Rank Test showed a statistically significant difference between pre- and post-intervention measurements (Z = −4.472;* p *< 0.001). These findings indicate a significant change following the administration of Moringa leaf extract gummy and date palm juice. However, the absence of a control group limits causal interpretation of the findings. Further controlled studies with larger samples and longer follow-up are required to confirm the effectiveness of this nutritional intervention.*

Keywords: *Body Weight, Date Palm Juice, Moringa Leaf Extract Gummy, Nutritional Intervention, Toddler.*

Abstrak: Pengaruh Pemberian *Gummy* Ekstrak Daun Kelor dan Sari Kurma terhadap Peningkatan Berat Badan Balita di TK DWP 3 Sukodono Malang. Kekurangan gizi pada masa balita dapat menghambat pertumbuhan dan perkembangan optimal sehingga diperlukan intervensi gizi berbasis pangan lokal yang dapat diterima anak. Penelitian ini bertujuan mengetahui pengaruh pemberian gummy ekstrak daun kelor dan sari kurma terhadap perubahan berat badan balita usia 4–5 tahun dengan status gizi kurang di TK DWP 3 Sukodono, Kabupaten Malang. Penelitian menggunakan desain pra-eksperimen *one-group pretest–posttest*. Sebanyak 32 balita dari populasi 35 balita dipilih menggunakan rumus Slovin serta berdasarkan kriteria inklusi dan eksklusi yang telah ditetapkan. Responden memperoleh dua butir gummy yang mengandung ekstrak daun kelor dan sari kurma setiap hari selama 30 hari. Pengukuran dilakukan sebelum dan setelah intervensi menggunakan timbangan digital. Data dianalisis menggunakan uji normalitas *Shapiro–Wilk* dan *Wilcoxon Signed-Rank Test*. Rerata skor pengukuran berubah dari 2,00 ± 0,00 sebelum intervensi menjadi 1,38 ± 0,49 setelah intervensi, dengan perubahan rerata sebesar −0,62 poin. Uji *Wilcoxon Signed-Rank* menunjukkan perbedaan yang bermakna antara pengukuran sebelum dan setelah intervensi (Z = −4,472; $p < 0,001$). Hasil tersebut menunjukkan adanya perubahan yang bermakna

setelah pemberian gummy ekstrak daun kelor dan sari kurma. Namun, tidak adanya kelompok kontrol membatasi interpretasi hubungan sebab-akibat. Penelitian terkontrol dengan jumlah sampel lebih besar dan masa tindak lanjut lebih panjang diperlukan untuk mengonfirmasi efektivitas intervensi ini.
Kata Kunci: Balita, Berat Badan, *Gummy* Ekstrak Daun Kelor, Intervensi Gizi, Sari Kurma.

INTRODUCTION

Toddlerhood is a critical period of growth and development characterized by rapid physical growth, brain maturation, and immune system development. Adequate and balanced nutritional intake during this period is essential because insufficient nutrient intake may impair physical growth, cognitive development, immune function, and long-term health. Undernutrition among children under five remains a major public health concern and is influenced by inadequate dietary intake, recurrent infections, and unfavorable socioeconomic and environmental conditions. Therefore, appropriate nutritional interventions during early childhood are required to support optimal growth and prevent persistent nutritional problems.

In Indonesia, childhood undernutrition remains an important health problem. According to the *Survei Status Gizi Indonesia* (SSGI) 2024, the national prevalence of stunting was 19.8%, while underweight and wasting were reported at 16.8% and 7.4%, respectively (Kementerian Kesehatan Republik Indonesia, 2025). At the local level, routine monitoring data from Kabupaten Malang showed a stunting prevalence of 6.15% in 2024. More specifically, the Puskesmas Dampit area, which includes Sukodono Village, recorded a stunting prevalence of 4.57% in August 2024 (Pemerintah Kabupaten Malang, 2025). These findings indicate that child nutritional problems remain present in the area surrounding the study site and support the need for acceptable, locally available, and practical nutritional interventions for children at risk of undernutrition.

Supplementary feeding and nutrition education are commonly implemented to improve child nutritional status; however, their success may be influenced by food diversity, nutrient density, adherence, and children's acceptance of the food provided. *Moringa oleifera* is a locally available food source containing protein and various micronutrients, whereas date palm (*Phoenix dactylifera*) provides carbohydrates, naturally occurring sugars, and minerals that can contribute to dietary energy and nutrient intake. Developing these ingredients into a child-friendly formulation may improve their acceptability as supplementary foods.

Several previous studies have investigated *Moringa oleifera* and date palm products separately. Muliawati (2020) conducted a quasi-experimental study involving 60 toddlers, with 30 participants in the intervention group and 30 in the control group. Daily administration of *Moringa oleifera* extract for 30 days was associated with an average body-weight increase of 0.420 kg. However, the intervention consisted of Moringa extract alone and did not evaluate a combined formulation with date palm juice. Veterini et al. (2023) evaluated Moringa leaf biscuits in 31 children under five for two months and reported an average body-weight increase of 0.35 kg per month. Nevertheless, the intervention used a biscuit formulation and similarly did not combine Moringa with date palm juice. Apriyanti et al. (2024) investigated date palm juice in 10 stunted infants using a one-group pretest–posttest design and reported significant differences in body-weight gain ($p < 0.001$) and body-length gain ($p = 0.001$). However, the study had a small sample, involved children younger than two years, and evaluated date palm juice without Moringa supplementation.

Thus, although previous studies suggest potential benefits of Moringa-

based foods and date palm juice for child growth, evidence regarding their combined administration remains limited, particularly among underweight children aged 4–5 years. In addition, previous studies have predominantly used extracts, biscuits, or date palm juice separately rather than a gummy formulation designed to increase palatability and ease of consumption among preschool-aged children. The novelty of the present study lies in evaluating Moringa leaf extract gummy and date palm juice as a combined nutritional intervention administered for 30 days to underweight toddlers aged 4–5 years at TK DWP 3 Sukodono, Malang Regency. Therefore, this study aimed to determine the effect of Moringa leaf extract gummy and date palm juice on body-weight changes among underweight toddlers. The research hypothesis was that daily administration of Moringa leaf extract gummy and date palm juice for 30 days would be associated with a significant increase in body weight among underweight toddlers aged 4–5 years.

METHODS

This study employed a pre-experimental one-group pretest–posttest design to evaluate changes in the nutritional status of toddlers before and after the administration of Moringa leaf extract gummy and date palm juice. The study was conducted from February to March 2026 at TK DWP 3 Sukodono, Malang Regency. The study population consisted of 35 toddlers with undernutrition. All children in the study population were screened according to the predetermined eligibility criteria, and 32 toddlers who met the criteria were included in the study. Three children were not included because they did not meet the study eligibility criteria. All 32 enrolled participants had complete pre-intervention and post-intervention measurements and were included in the final analysis.

The inclusion criteria were toddlers aged 4–5 years with undernutrition status based on nutritional-status records in the Kartu Menuju Sehat (KMS) and whose parents or legal guardians agreed to their participation by providing informed consent. Children with severe illness or metabolic disorders that could affect food intake, body weight, or growth were excluded from the study.

The intervention consisted of Moringa leaf extract gummy and date palm juice administered for 30 consecutive days. Each participant received two gummies per day. The intervention was provided consistently throughout the study period to ensure that all participants received the same daily dose and duration of supplementation. Parents or guardians were informed about the daily administration schedule and were asked to ensure regular consumption of the intervention throughout the 30-day period.

Body weight was measured before the intervention (pretest) and after completion of the 30-day intervention (posttest) using a digital weighing scale. Measurements were performed with the child standing on the center of the scale in a stable position. Body-weight measurements were recorded on standardized observation sheets. The Kartu Menuju Sehat (KMS) was additionally used as a supporting growth-monitoring document to assess and record the nutritional-status category of each participant (World Health Organization, 2006; Kementerian Kesehatan Republik Indonesia, 2020). Thus, the observation sheet was used to document the numerical measurement results, whereas the KMS was used to support interpretation of the child's nutritional status and growth trajectory.

Primary data consisted of measurements obtained directly from the participants before and after the intervention, while secondary data were obtained from supporting child-health and nutritional-status records. For statistical analysis, nutritional status derived from the pre-intervention and post-intervention measurements was classified as an ordinal variable according to the categories used in the study.

Univariate analysis was performed to describe participant characteristics, including age, sex, parental education, and economic status. Categorical variables were presented as frequencies and percentages. Bivariate analysis was performed to determine differences between pre-intervention and post-intervention measurements. The Shapiro–Wilk test was used to examine the distribution of the data. Because the paired outcome data analyzed in this study were ordinal and did not meet the assumption of normality, differences between pre-intervention and post-intervention measurements were evaluated using the Wilcoxon Signed-Rank Test. Statistical significance was defined as $p < 0.05$, and exact p values were reported whenever applicable.

In addition to statistical significance, the magnitude of the intervention effect was estimated using the effect-size coefficient for the Wilcoxon Signed-Rank Test, calculated as $r = |Z|/\sqrt{N}$, where Z represents the Wilcoxon test statistic and N represents the number of paired observations included in the analysis. Effect size was interpreted to provide additional information regarding the magnitude of the observed pre–post difference rather than relying solely on statistical significance.

This study received ethical approval under approval number KEPK-EC/516/II/2026. Written informed consent was obtained from the parents or legal guardians before participant enrollment. Participant confidentiality was maintained by restricting the use of identifying information, and participants' safety, privacy, and rights were protected throughout the study.

RESULTS

Data from 32 toddlers aged 4–5 years were included in the analysis. The results are presented according to participant characteristics and changes in nutritional-status scores before and after the administration of Moringa leaf extract gummy and date palm juice.

Table 1. Characteristics of Respondents (n = 32)

Characteristic	n	Percentage (%)
Age		
4 years	16	50.0
5 years	16	50.0
Gender		
Male	12	37.5
Female	20	62.5
Parental Education		
Elementary School	3	9.4
Junior High School	6	18.8
Senior High School	18	56.3
College	5	15.6
Economic Status		
Low	11	34.4
Middle	13	40.6
High	8	25.0

Table 1 shows that the participants were equally distributed between the ages of 4 and 5 years, with 16 children (50.0%) in each age group. Most participants were female (62.5%). The majority of parents had completed senior high school education (56.3%), and the largest proportion of families belonged to the middle economic category (40.6%).

Table 2. Nutritional-Status Scores Before and After the Intervention

Measurement	n	Mean	SD	Mean Change
Pre-test	32	2.00	0.00	–
Post-test	32	1.38	0.49	−0.62

Values are nutritional-status category scores, not body weight in kilograms; a lower score indicates a better nutritional-status category.

The mean nutritional-status score decreased from 2.00 ± 0.00 before the intervention to 1.38 ± 0.49 after the 30-day intervention, corresponding to a mean numerical change of −0.62 points. These values represent nutritional-status category scores rather than body weight measured in kilograms. Therefore, they should not be interpreted as a reduction of 0.62 kg in body weight.

Because the outcome used in the inferential analysis was an ordinal nutritional-status variable, a normality test was not required to determine the statistical test. Differences between paired pre-intervention and post-intervention nutritional-status scores were analyzed using the Wilcoxon Signed-Rank Test.

Table 3. Difference in Nutritional-Status Scores Before and After the Intervention

Variable	n	Z	*p* value	Effect Size (*r*)
Nutritional-status score	32	−4.472	<0.001	0.79

Wilcoxon Signed-Rank Test; effect size calculated as $r = |Z|/\sqrt{N}$.

The Wilcoxon Signed-Rank Test demonstrated a statistically significant difference between nutritional-status scores before and after the intervention ($Z = -4.472$, $p < 0.001$). The effect size was $r = 0.79$, indicating a large magnitude of pre–post change. The mean category score decreased from 2.00 to 1.38 after the administration of Moringa leaf extract gummy and date palm juice.

DISCUSSION

The participants in this study were equally distributed between the ages of 4 and 5 years, with a higher proportion of female toddlers. Most parents had completed senior high school education, and the largest proportion of families belonged to the middle economic category. These characteristics describe the study population; however, parental education and economic status were not analyzed in relation to changes in the study outcome. Therefore, no conclusion can be drawn regarding their influence on the observed nutritional-status changes, and these variables should be interpreted only as baseline characteristics.

The main finding of this study was a significant change in nutritional-status scores after 30 days of administration of Moringa leaf extract gummy and date palm juice. The mean nutritional-status score decreased from 2.00 ± 0.00 before the intervention to 1.38 ± 0.49 after the intervention, representing a mean numerical change of −0.62 points. In the nutritional-status coding used in this study, a lower score represented movement toward a better nutritional-status category; therefore, this numerical decrease should not be interpreted as a decrease of 0.62 kg in body weight. The Wilcoxon Signed-Rank Test demonstrated a statistically significant pre–post difference ($Z = -4.472$, $p < 0.001$), with an effect size of $r = 0.79$, indicating a large magnitude of change between the two measurements.

The direction of the present finding is consistent with several intervention studies involving *Moringa oleifera*. Muliawati (2020) reported an average body-weight increase of 0.420 kg after daily administration of Moringa extract for 30 days among toddlers.

Abdullah et al. (2022) similarly reported an increase in mean body weight from 9.55 kg to 10.09 kg among undernourished children aged 2–5 years after supplementation with cookies containing Moringa leaf flour. Veterini et al. (2023) reported an average body-weight increase of approximately 0.35 kg per month and a height increase of 0.65 cm per month during a two-month Moringa-biscuit intervention. Studies using other Moringa-based formulations have also reported improvements in body weight or nutritional status among children (Irwan et al., 2020; Yadav et al., 2022; Founmilayo et al., 2023; Lessy et al., 2026; Putri et al., 2026).

Controlled evidence, however, indicates that the effect of Moringa supplementation is not uniform across populations and intervention protocols. In a randomized controlled trial involving 237 infants, Boateng et al. (2019) found that 5 g/day of Moringa leaf powder administered for four months did not significantly improve growth indicators compared with the control group. Conversely, Yadav et al. (2022) reported significantly greater weight gain (p = 0.012) and fewer children with severe wasting (p = 0.032) after two months among children with severe acute malnutrition who received Moringa leaf powder in addition to routine nutritional management. Founmilayo et al. (2023) reported an average six-month weight gain of 1.72 kg in children receiving Moringa-fortified complementary food compared with 1.08 kg in the control group. More recently, Lessy et al. (2026) found significantly greater weight gain among undernourished children aged 36–59 months who received 15 g/day Moringa leaf powder plus one egg for 60 days compared with children receiving an egg alone. These differences suggest that age, baseline nutritional status, Moringa dose, duration, background diet, adherence, and the nutritional composition of the carrier food may influence the magnitude of the response (Boateng et al., 2019; Shija et al., 2019; Malla et al., 2022).

Observational evidence also supports an association between Moringa consumption and nutritional status, although it cannot establish causality. Agedew et al. (2022) found lower prevalences of stunting and wasting among under-five children consuming a *Moringa stenopetala*-based diet than among non-consumers in Southern Ethiopia. Such evidence supports the nutritional potential of Moringa-based foods but also highlights the importance of distinguishing habitual dietary patterns from a standardized intervention such as that evaluated in the present study.

Evidence regarding date palm juice provides an additional basis for considering the combined intervention. Apriyanti et al. (2024) evaluated date palm juice in 10 stunted children younger than two years and reported significant improvements in body-weight gain ($p < 0.001$) and body-length gain (p = 0.001). In a larger quasi-experimental study, Suharto and Rantesigi (2023) compared children receiving date palm juice with a control group and reported significant changes in anthropometric outcomes after three months in the intervention group. Budiana and Marlina (2020) administered 5 mL/day of a date-based supplement for three months to stunted toddlers aged 24–59 months and reported an improvement in height-for-age z-score from −2.62 SD to −2.30 SD. More recent evidence also suggests that date juice may improve appetite among toddlers with nutritional problems (Ismayanty et al., 2025). Nevertheless, these studies differ in age groups, formulations, outcomes, intervention duration, and methodological quality; therefore, their findings cannot be directly extrapolated to the present intervention.

The potential nutritional contribution of date palm is biologically plausible because date fruit is predominantly carbohydrate-rich and contains glucose, fructose, dietary fiber, potassium, calcium, magnesium, and other micronutrients (Ibrahim et al., 2021; Barakat and Alfheeaid, 2023). Evidence from children also suggests that date consumption may contribute

micronutrients relevant to nutritional recovery. Irandegani et al. (2019), for example, reported increases in hemoglobin, hematocrit, and serum ferritin after two months of date consumption among school-aged girls with iron-deficiency anemia. This finding does not demonstrate an effect on toddler growth, but it supports the nutritional relevance of date fruit as a supplementary food source.

Moringa oleifera leaves have a complementary nutritional profile. They contain protein, essential amino acids, iron, calcium, carotenoids, vitamin C, and other bioactive compounds (Peñalver et al., 2022). Protein and essential amino acids provide substrates for tissue synthesis, while adequate energy intake is required to prevent dietary protein from being preferentially utilized for energy. Calcium and provitamin A contribute to normal growth and tissue development, whereas iron and vitamin-related pathways contribute to hematopoiesis and metabolic function. The combination of Moringa leaf extract and date palm juice may therefore provide complementary nutrient sources: Moringa contributes protein and micronutrients, while date palm provides readily available carbohydrate-derived energy (Ibrahim et al., 2021; Peñalver et al., 2022; Barakat and Alfheeaid, 2023). However, this proposed mechanism remains theoretical in the present study because the nutrient composition and bioavailability of the actual gummy formulation were not measured.

According to the Indonesian Recommended Dietary Allowance, children aged 4–6 years require approximately 1,400 kcal of energy and 25 g of protein per day (Kementerian Kesehatan Republik Indonesia, 2019). Ideally, the contribution of the study intervention should therefore be expressed as the proportion of these daily requirements provided by two gummies. However, the energy, protein, iron, calcium, vitamin A, vitamin C, and other nutrient contents of the daily dose were not quantitatively analyzed. Consequently, the extent to which the observed nutritional-status change can be explained by additional energy or nutrient intake from the intervention cannot be determined. Future formulations should undergo proximate and micronutrient analysis so that the dose can be expressed in both grams of product and actual nutritional contribution.

The dosage form should also be interpreted cautiously. A gummy may be convenient for preschool-aged children and may facilitate portion standardization, but palatability, acceptability, and adherence were not quantitatively assessed in this study. Evidence from Moringa-based biscuits, complementary foods, and fortified porridges indicates that food vehicle, sensory characteristics, and adherence can influence intervention exposure and possibly outcomes (Boateng et al., 2019; Irwan et al., 2020; Malla et al., 2022; Veterini et al., 2023). Therefore, the present study cannot establish that a gummy formulation is superior to other Moringa-based dosage forms. Future studies should measure consumption compliance, missed doses, organoleptic acceptance, and reasons for non-adherence.

From a practical perspective, Moringa leaf extract gummy and date palm juice may represent a potential locally based supplementary nutritional approach for children with undernutrition. The statistically significant pre–post change observed in this study supports further investigation of the formulation but should be interpreted as an association rather than definitive evidence of efficacy. This distinction is particularly important because some controlled Moringa studies have demonstrated anthropometric improvement whereas others have not (Boateng et al., 2019; Yadav et al., 2022). Confirmation requires actual body-weight measurements in kilograms, standardized anthropometric indices such as weight-for-age z-scores, quantitative characterization of the intervention, assessment of dietary intake and adherence, and an appropriately controlled study design.

Study Limitations

This study has several limitations. First, the pre-experimental one-group pretest–posttest design did not include a concurrent control group or randomization. Consequently, the observed changes cannot be attributed exclusively to Moringa leaf extract gummy and date palm juice. Natural growth during the 30-day intervention period, the Hawthorne effect, and regression to the mean may have contributed to the observed changes.

Second, potential confounding factors, including habitual energy and nutrient intake, episodes of acute infection, participation in other supplementary feeding programs, and parental feeding practices, were not systematically measured or adjusted for. These factors may independently influence body weight and nutritional status.

Third, the study involved only 32 participants from a single kindergarten, resulting in a relatively small and geographically restricted sample. The findings may therefore have limited generalizability to children with different ages, baseline nutritional conditions, socioeconomic backgrounds, or geographical settings.

Fourth, the available statistical analysis was based on nutritional-status category scores rather than numerical body-weight changes expressed in kilograms. Therefore, the actual magnitude of weight gain and its clinical relevance could not be determined. Future studies should report body weight in kilograms, mean or median changes with 95% confidence intervals, and standardized anthropometric indices such as weight-for-age, weight-for-height, or BMI-for-age z-scores, as appropriate.

Fifth, the nutrient composition of the daily intervention was not quantitatively analyzed. The exact contribution of two gummies to daily energy, protein, iron, calcium, vitamin A, vitamin C, and other nutrient requirements could therefore not be established. In addition, the absence of detailed adherence monitoring and repeated standardized anthropometric measurements may have introduced intervention-adherence and measurement bias.

Future research should employ a randomized controlled design with a larger sample, longer intervention and follow-up periods, standardized anthropometric measurements, quantitative nutrient analysis of the intervention, assessment of habitual dietary intake, monitoring of infection and concurrent nutritional programs, and objective measurement of adherence. These improvements would allow a more robust assessment of the clinical effectiveness of Moringa leaf extract gummy and date palm juice in improving nutritional outcomes among undernourished children.

CONCLUSION

This study found a statistically significant change in nutritional-status scores among underweight toddlers aged 4–5 years after 30 days of Moringa leaf extract gummy and date palm juice administration. The mean nutritional-status score decreased from 2.00 ± 0.00 before the intervention to 1.38 ± 0.49 after the intervention, with a mean change of −0.62 points; the Wilcoxon Signed-Rank Test showed a significant difference ($Z = -4.472$, $p < 0.001$) with a large effect size ($r = 0.79$). These findings indicate an improvement in nutritional-status category after the intervention period and are consistent with the study objective. However, because the study used a one-group pretest–posttest design without a control group, a causal relationship between the intervention and the observed improvement cannot yet be established. Further controlled studies with larger samples, longer follow-up, and direct reporting of body-weight changes in kilograms are recommended to confirm the clinical effectiveness of Moringa leaf extract gummy and date palm juice.

REFERENCES

Abdullah, A.R., Wahyuni, F., Nurcahyani, I.D., Musdalifah and Syafruddin, 2022. Pengaruh pemberian cookies

dengan penambahan tepung daun kelor terhadap kenaikan berat badan balita usia 2–5 tahun dengan status gizi kurang berdasarkan BB/TB di wilayah kerja Puskesmas Bontoa tahun 2021. Jurnal Gizi dan Kesehatan, 14(1), pp.128–137. Available at: https://doi.org/10.35473/jgk.v14i1.273

Agedew, E., Misker, D., Gelibo, T., Tadelle, A., Makonnen, E., Worku, S., Bekele, A., Mekonnen, Y., Belay, A., Challa, F., Awoke, T., Gemeda, N., Kerebih, H., Shiberu, S. and Debella, A., 2022. Does Moringa stenopetala-based diet consumption decrease burden of undernutrition in under-five children, Southern Ethiopia? Heliyon, 8(8), p.e10285. Available at: https://doi.org/10.1016/j.heliyon.2022.e10285

Apriyanti, I., Lufar, N. and Rahma, N.A., 2024. The effectiveness of date palm juice on improving growth in stunted infants. Faletehan Health Journal, 11(2), pp.135–142. Available at: https://doi.org/10.33746/fhj.v11i02.705

Barakat, H. and Alfheeaid, H.A., 2023. Date palm fruit (Phoenix dactylifera) and its promising potential in developing functional energy bars: Review of chemical, nutritional, functional, and sensory attributes. Nutrients, 15(9), p.2134. Available at: https://doi.org/10.3390/nu15092134

Boateng, L., Quarpong, W., Ohemeng, A., Asante, M. and Steiner-Asiedu, M., 2019. Effect of complementary foods fortified with Moringa oleifera leaf powder on hemoglobin concentration and growth of infants in the Eastern Region of Ghana. Food Science & Nutrition, 7(1), pp.302–311. Available at: https://doi.org/10.1002/fsn3.890

Budiana, T.A. and Marlina, D., 2020. Efektivitas Healthy Dates sebagai suplemen koreksi pertumbuhan balita stunting di Kota Cimahi. Jurnal Ilmu Kesehatan Bhakti Husada: Health Sciences Journal, 11(2), pp.137–151. Available at: https://doi.org/10.34305/jikbh.v11i2.185

Founmilayo, L.F.T., Nadia, F.F. and Polycarpe, K., 2023. Impact of Moringa oleifera leaf flour supplement on weight gain in moderately acutely malnourished children in Benin. Archives of Food and Nutritional Science, 7(1), pp.70–77. Available at: https://doi.org/10.29328/journal.afns.1001052

Ibrahim, S.A., Ayad, A.A., Williams, L.L., Ayivi, R.D., Gyawali, R., Krastanov, A. and Aljaloud, S.O., 2021. Date fruit: A review of the chemical and nutritional compounds, functional effects and food application in nutrition bars for athletes. International Journal of Food Science & Technology, 56(4), pp.1503–1513. Available at: https://doi.org/10.1111/ijfs.14783

Irandegani, F., Arbabisarjou, A., Ghaljaei, F., Navidian, A. and Karajibani, M., 2019. The effect of a date consumption-based nutritional program on iron deficiency anemia in primary school girls aged 8 to 10 years old in Zahedan (Iran). Pediatric Health, Medicine and Therapeutics, 10, pp.183–188. Available at: https://doi.org/10.2147/PHMT.S225816

Irwan, Z., Salim, A. and Adam, A., 2020. Pemberian cookies tepung daun dan biji kelor terhadap berat badan dan status gizi anak balita di wilayah kerja Puskesmas Tampa Padang. AcTion: Aceh Nutrition Journal, 5(1), pp.45–54. Available at: https://doi.org/10.30867/action.v5i1.198

Ismayanty, D., Mahmudah, R. and Avicenna, E., 2025. Comparison of the effectiveness of giving Randu honey and date juice in increasing appetite of stunting toddlers. Faletehan Health Journal, 12(2),

pp.205–212. Available at: https://doi.org/10.33746/fhj.v12i02.836

Kementerian Kesehatan Republik Indonesia, 2019. Peraturan Menteri Kesehatan Republik Indonesia Nomor 28 Tahun 2019 tentang Angka Kecukupan Gizi yang Dianjurkan untuk Masyarakat Indonesia. Jakarta: Kementerian Kesehatan Republik Indonesia.

Kementerian Kesehatan Republik Indonesia, 2020. Peraturan Menteri Kesehatan Republik Indonesia Nomor 2 Tahun 2020 tentang Standar Antropometri Anak. Jakarta: Kementerian Kesehatan Republik Indonesia.

Kementerian Kesehatan Republik Indonesia, 2025. Survei Status Gizi Indonesia (SSGI) 2024 dalam angka. Jakarta: Kementerian Kesehatan Republik Indonesia.

Lessy, H., Noer, E.R., Syauqy, A. and Afifah, D.N., 2026. Effect of Moringa oleifera leaf powder and egg supplementation on weight gain and hemoglobin in undernourished children aged 36–59 months. AcTion: Aceh Nutrition Journal, 11(2), pp.462–471. Available at: https://doi.org/10.30867/action.v11i2.2944

Malla, J.K., Ochola, S., Ogada, I. and Munyaka, A., 2022. Effect of Moringa oleifera-fortified porridge consumption on protein and vitamin A status of children with cerebral palsy in Nairobi, Kenya: A randomized controlled trial. PLOS Global Public Health, 2(11), p.e0001206. Available at: https://doi.org/10.1371/journal.pgph.0001206

Muliawati, D., 2020. Pemanfaatan ekstrak daun kelor (Moringa oleifera) dalam meningkatkan berat badan balita. Jurnal Kesehatan Madani Medika, 11(1), pp.44–53. Available at: https://doi.org/10.36569/jmm.v11i1.98

Peñalver, R., Martínez-Zamora, L., Lorenzo, J.M., Ros, G. and Nieto, G., 2022. Nutritional and antioxidant properties of Moringa oleifera leaves in functional foods. Foods, 11(8), p.1107. Available at: https://doi.org/10.3390/foods11081107

Pemerintah Kabupaten Malang, 2025. Kabupaten Malang Satu Data Edisi 2025. Malang: Pemerintah Kabupaten Malang.

Putri, L.B., Pramono, A., Muis, S.F., Mahati, E. and Afifah, D.N., 2026. The effect of Moringa leaf powder and egg supplementation on nutritional status and appetite: A quasi-experimental study in undernourished children. Journal of Health and Nutrition Research, 5(1), pp.390–400. Available at: https://doi.org/10.56303/jhnresearch.v5i1.1080

Shija, A.E., Rumisha, S.F., Oriyo, N.M., Kilima, S.P. and Massaga, J.J., 2019. Effect of Moringa oleifera leaf powder supplementation on reducing anemia in children below two years in Kisarawe District, Tanzania. Food Science & Nutrition, 7(8), pp.2584–2594. Available at: https://doi.org/10.1002/fsn3.1110

Suharto, D.N. and Rantesigi, N., 2023. The effect of date palm (Phoenix dactylifera) juice to prevent stunting. Jurnal Keperawatan Komprehensif (Comprehensive Nursing Journal), 9(2). Available at: https://doi.org/10.33755/jkk.v9i2.460

Veterini, A.S., Susanti, E., Ardiana, M., Adi, A.C. and Rachmawati, H., 2023. Effects of consuming biscuits made from Moringa oleifera leaf on body weight and height of children under five in Bangkalan, Madura Island. Media Gizi Indonesia, 18(2), pp.150–156. Available at: https://doi.org/10.20473/mgi.v18i2.150-156

World Health Organization, 2006. WHO child growth standards: Length/height-for-age, weight-for-age, weight-for-length, weight-for-

height and body mass index-for-age: Methods and development. Geneva: World Health Organization.

Yadav, H., Gaur, A. and Bansal, S.C., 2022. Effect of Moringa oleifera leaf powder supplementation in children with severe acute malnutrition in Gwalior District of Central India: A randomised controlled trial. Journal of Clinical and Diagnostic Research, 16(8), pp.SC09–SC14. Available at: https://doi.org/10.7860/JCDR/2022/55126.16746