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EFFECT OF JELAWAT FISH AS SUPPLEMENTARY FOOD ON NUTRIENT INTAKE AND BODY WEIGHT OF UNDERNOURISHED TODDLERS

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ABSTRACT
Undernutrition among children under five remains a nutritional problem that may impair growth and development. Supplementary feeding based on local food resources is one strategy to improve nutrient intake and nutritional status. Jelawat fish (Leptobarbus hoevenii) is a local freshwater fish rich in protein, fat, and energy that has the potential to support nutritional improvement among undernourished children. To analyse the effect of jelawat fish supplementation on energy, fat, and protein intake, as well as body weight among undernourished children under five years of age. This study applied a quasi-experimental pretest–posttest control group design involving 48 undernourished children between 24 and 59 months of age. Participants were assigned to a control group, a fried jelawat fish group (79 g/day), and a jelawat fish soup group (121 g/day) for 14 days. Participants' dietary intake was evaluated using two non-consecutive 24-hour food recall interviews, body weight was recorded using a calibrated digital scale with 0.1 kg precision. Data were analysed using Paired Sample t-test, One-Way ANOVA, Post Hoc test, Kruskal–Wallis test, and Mann–Whitney test. Significant increases in energy, fat, and protein intake, as well as body weight, were observed in both intervention groups ($p<0.05$). Mean changes in energy intake were 170.73±85.95 kcal and 128.14±108.82 kcal in the fried and soup groups, respectively. Mean changes in fat intake were 11.29±6.74 g and 7.34±7.82 g, while mean changes in protein intake were 4.45±5.43 g and 3.26±2.73 g. Mean body weight gains were 0.250±0.146 kg and 0.244±0.186 kg. Significant differences were found between the control group and both intervention groups ($p<0.05$), whereas no significant differences were observed between the fried jelawat fish and jelawat fish soup groups ($p>0.05$). Supplementation with jelawat fish (Leptobarbus hoevenii) increased energy, fat, and protein intake and body weight among undernourished children under five in Balangan Regency. Jelawat fish has the potential to be utilised as a local real-food supplementary feeding intervention to support nutritional improvement among undernourished children.

Keywords: body weight; energy intake; fat intake; jelawat fish; protein intake; undernutrition

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INTRODUCTION

Undernutrition among children under five remains an important public health concern because it can affect both growth and development during early childhood. Children aged 24–59 months are particularly vulnerable to undernutrition as they experience rapid growth, become increasingly active, and begin consuming family foods that may not always meet their nutritional needs. When inadequate nutrient intake persists over a prolonged period, it may negatively affect physical growth, cognitive development, and overall health later in life. Body weight-for-age (W/A) is one of the anthropometric indicators commonly used to assess the nutritional status of young children because it reflects their nutritional condition and is sensitive to changes that occur over a relatively short period. Therefore, changes in body weight are frequently used to evaluate the effectiveness of

nutritional interventions among undernourished children (Pranindita & Cahyati, 2022; Sari & Sari, 2022; Nayak et al., 2023; Kementerian Kesehatan RI, 2020).

The 2024 Indonesian Nutritional Status Survey reported that the prevalence of undernutrition in Indonesia remained at 16.9%. In South Kalimantan Province, the prevalence reached 22.2%, exceeding the national figure. In Balangan Regency, undernutrition remains a public health concern. Data from the Balangan District Health Office in 2025 showed that the highest numbers of undernourished children were recorded in Awayan Primary Health Centre 66 children, South Paringin Primary Health Centre 55 children, and Lampihong Primary Health Centre 49 children. These findings indicate the need for sustainable nutritional improvement programmes to address undernutrition among children under five in the region (Kemenkes RI, 2025; Dinas Kesehatan Kabupaten Balangan, 2025).

Inadequate intake of energy, protein, and fat is one of the main factors contributing to undernutrition among children under five. Energy is required to support daily activities and metabolic processes, while protein plays an essential role in growth and tissue repair. When energy intake is insufficient, protein may be utilised as an energy source rather than for growth, which can impair a child's development. Fat also serves as an important source of energy that helps meet the nutritional needs of children during periods of rapid growth. Therefore, various efforts have been implemented to improve nutrient intake among children, including supplementary feeding programmes. In recent years, the use of local foods as the basis for supplementary feeding has gained increasing attention because it is more acceptable to communities, aligns with local dietary habits, and has the potential to provide a sustainable approach to improving child nutrition (Nasution et al., 2024; Kusumaatmaja et al., 2025; Allo et al., 2023; Lestari et al., 2025).

Fish is an important source of animal protein that also provides fat and energy to support child growth and development. Jelawat fish (Leptobarbus hoevenii) is a local freshwater fish commonly found in Kalimantan. Silaban et al. (2017) reported that jelawat fish contains 18.14% protein and 9.93% fat. Its protein content is higher than that of several freshwater fish commonly used in nutritional interventions for children, including striped catfish (17.31%) and catfish (17.04%) (Atasasih et al., 2023; Ciptawati et al., 2021). Previous studies have shown that fish-based supplementary feeding can improve nutrient intake and nutritional status among children (Bustami et al., 2023; Fadilasari et al., 2024; Herlina et al., 2025). However, most of these interventions have used processed fish products, while studies evaluating the use of jelawat fish as a local real-food supplementary feeding intervention for undernourished children remain limited. Therefore, jelawat fish has the potential to serve as a local food-based alternative for supporting nutritional improvement among children under five.

Based on the above considerations, this study aimed to analyse the effect of jelawat fish (Leptobarbus hoevenii) supplementation on energy, fat, and protein intake, as well as body weight, among undernourished children under five in Balangan Regency. The novelty of this study lies in the use of jelawat fish as a local real-food intervention provided in two simple preparations, namely fried jelawat fish and jelawat fish soup, as an alternative nutritional intervention for undernourished children.

METHOD

This study employed a quasi experimental design using a pretest–posttest control group approach. The study was conducted in the working areas of Awayan Primary Health Centre, South Paringin Primary Health Centre, and Lampihong Primary Health Centre, Balangan Regency, South Kalimantan, Indonesia. The target population included undernourished children aged 24–59 months residing in the study area. A total of 48 children were selected using purposive sampling according to the predetermined inclusion and exclusion criteria. Participants were allocated into three groups:

a control group (n=16), a fried jelawat fish group receiving 79 g/day (n=16), and a jelawat fish soup group receiving 121 g/day (n=16). The intervention was administered daily for 14 consecutive days. Fried jelawat fish was prepared using a small amount of cooking oil and cooked for 7 minutes until fully cooked, whereas jelawat fish soup was prepared by boiling for 8 minutes. Dosage determination was based on equivalent protein content, with both intervention groups receiving 6 g of protein per serving. Each serving of fried jelawat fish provided 128 kcal of energy, 10.35 g of fat, and 6 g of protein, while each serving of jelawat fish soup provided 121 kcal of energy, 9.40 g of fat, and 6 g of protein.

Participant characteristics were collected through structured interviews. Energy, fat, and protein intake were assessed using the 24-hour dietary recall method before and after the intervention, while body weight was measured using a digital weighing scale with 0.1 kg precision. Statistical analyses were performed using SPSS version 27. Changes in energy, fat, protein intake, and body weight before and after the intervention were analysed using the Paired Sample t-test, as the data were normally distributed. Differences in the mean changes of energy, fat, and protein intake among groups were analysed using One-Way ANOVA followed by Post Hoc tests. Changes in body weight among groups were analysed using the Kruskal–Wallis test because some data were not normally distributed, followed by the Mann–Whitney test for pairwise comparisons. Statistical significance was set at $p<0.05$. Ethical approval was obtained from the Health Research Ethics Committee of Dr. Moewardi Regional General Hospital, Surakarta (No. 244/II.HREC/2026).

RESULT

Table 1 presents the mean changes in energy intake, fat intake, protein intake, and body weight among the study groups following the intervention.

Table 1.
Changes (Δ) in Energy Intake, Fat Intake, Protein Intake, and Body Weight Among Study Groups

Variable	Control (Mean ± SD)	Fried Jelawat Fish (Mean ± SD)	Jelawat Fish Soup (Mean ± SD)	p-value
Δ Energy Intake (kcal)	0.07 ± 63.07[a]	170.73 ± 85.95[b]	128.14 ± 108.82[b]	0.001
Δ Fat Intake (g)	1.78 ± 5.55[a]	11.29 ± 6.74[b]	7.34 ± 7.82[ab]	0.001
Δ Protein Intake (g)	-0.91 ± 3.92[a]	4.45 ± 5.43[b]	3.26 ± 2.73[b]	0.002
Δ Body Weight (kg)	0.069 ± 0.268[a]	0.250 ± 0.146[b]	0.244 ± 0.186[b]	<0.001

Source: Primary Data (2026)

Notes:

1. Values are presented as mean ± SD.
2. p-values were obtained using One-Way ANOVA for energy, fat, and protein intake, and Kruskal–Wallis test for body weight.
3. Different superscript letters within the same row indicate significant differences between groups based on Post Hoc or Mann–Whitney tests ($p<0.05$).

Based on Table 1, significant differences were observed in the changes in energy intake, fat intake, protein intake, and body weight among the study groups ($p<0.05$). Both intervention groups showed greater improvements in all outcome variables compared with the control group. The fried jelawat fish group showed the highest mean increase in energy intake and fat intake, while both fried and soup jelawat fish groups demonstrated comparable improvements in protein intake and body weight. No significant differences were found between the two intervention groups ($p>0.05$).

DISCUSSION

Effect of Jelawat Fish Supplementation on Energy Intake

Energy intake is a critical component in meeting the nutritional requirements of young children, as it provides the necessary energy for growth, development, physical activity, and metabolic functions. Inadequate energy intake over a prolonged period may result in growth faltering, weight

loss, increased susceptibility to infections, and undernutrition. Therefore, adequate energy intake is essential to support optimal child growth and nutritional status. According to the Indonesian Recommended Dietary Allowance (RDA), the energy requirement is 1350 kcal/day for children aged 1–3 years and 1400 kcal/day for children aged 4–6 years (Kemenkes RI, 2019).

The improvement in energy intake observed in the intervention groups can be attributed to the addition of jelawat fish as a nutrient-dense animal-source food. Fish is recognized as a high-quality source of animal protein and fat, containing essential amino acids, fatty acids, vitamins, and minerals within a relatively high nutrient density. This characteristic allows fish to contribute significantly to improving overall dietary quality, particularly in children with inadequate dietary intake (Izah et al., 2024; Sholikhah & Dewi, 2022). From a nutritional perspective, the increase in energy intake is likely associated with the combined contribution of protein and fat from fish. Protein plays a key role in tissue synthesis, enzymatic activity, and hormonal regulation, while dietary fat increases the energy density of meals, which is particularly beneficial for undernourished children who often require energy-dense foods in small portions. In addition, fish provides essential amino acids that are important for growth and maintenance of body tissues (Puady & Sartika, 2024).

These findings are consistent with the study conducted by Rahayu and Casnuri (2022), which reported that fish consumption as a source of animal protein improved dietary quality and contributed to increased daily energy intake among children. Their study demonstrated that regular fish consumption could help meet energy and macronutrient requirements necessary for optimal child growth. The present findings are also supported by Hardiana et al. (2024), who reported that the utilisation of fish-based local foods as supplementary feeding significantly improved energy intake among children with nutritional problems. Energy derived from protein and fat contained in fish contributed to increased total daily energy intake and improved dietary adequacy during the intervention period. The absence of a significant difference between the fried jelawat fish group and the jelawat fish soup group indicates that both preparation methods were similarly effective in improving energy intake among undernourished children. Although the cooking methods differed, both interventions used the same primary ingredient, namely jelawat fish, which provided relatively comparable energy contributions. These findings suggest that both fried and soup-based jelawat fish preparations can be utilised as practical local-food supplementary feeding alternatives.

Effect of Jelawat Fish Supplementation on Fat Intake

Fat is an essential macronutrient that serves as the body's primary source of energy, providing approximately 9 kcal per gram. Beyond its role as an energy source, fat is also involved in cell membrane formation, organ protection, absorption of fat-soluble vitamins (A, D, E, and K), and supports growth and development in children. Therefore, adequate fat intake during early childhood is crucial to ensure optimal growth and developmental outcomes (Kemenkes RI, 2019; Nasution et al., 2024).

The greater increase in fat intake observed in the fried jelawat fish group can be explained by the frying process, which uses oil as a heat transfer medium. During frying, oil is absorbed into the food matrix, particularly due to pore formation in the food structure caused by heating, which increases the final fat content compared with moist-heat cooking methods such as boiling or soup preparation (Malkan et al., 2017). This finding is consistent with previous studies reporting that food processing methods influence the nutritional composition of fish, including changes in fat content due to cooking processes (Ciptawati et al., 2021). In addition, Ambeng et al. (2024) reported that both frying duration and process significantly affect the fat content of fish due to the interaction between oil and food during cooking.

Overall, the results of this study indicate that the fried jelawat fish group showed a greater increase in fat intake compared to the control group, whereas the fish soup group did not demonstrate a statistically significant change. This suggests that cooking methods contribute to differences in fat intake among the study groups. These findings are also consistent with previous studies showing that fish-based products can improve macronutrient intake in children. Aryana et al. (2022) reported that consumption of processed fish products supports improvements in nutritional status due to their fat and energy content. Similarly, Nurhayati et al. (2024) found that fried fish-based products effectively improved weight gain in undernourished children, indicating the contribution of dietary fat and energy in supporting nutritional recovery. In conclusion, jelawat fish has potential as a local animal-source food that can be used as a supplementary feeding option to improve fat intake in undernourished children, particularly when prepared using high-energy-density cooking methods such as frying.

Effect of Jelawat Fish Supplementation on Protein Intake

Protein is one of the major macronutrients that plays an essential role as a structural component of cells, tissues, and organs in the human body. Biologically, protein has several important functions, including as a structural component, an enzyme involved in metabolic reactions, and a regulatory substance in various physiological processes. Chemically, protein is composed of amino acid chains linked by peptide bonds, forming complex molecular structures. Protein can also undergo denaturation, which refers to structural changes in its secondary, tertiary, or quaternary structures that alter its physical and biological properties. This process may be influenced by factors such as temperature and pH. In early childhood, protein plays a critical role in supporting growth, tissue repair, and overall body function (Cintya et al., 2025).

The increase in protein intake in both intervention groups may be attributed to the additional protein provided through jelawat fish supplementation during the 14-day intervention period. In this study, both fried jelawat fish and jelawat fish soup were formulated to contain equal protein content, namely 6 grams per serving, ensuring that each child received a comparable amount of animal-source protein. Therefore, the observed increase in protein intake was mainly driven by the additional dietary protein from the intervention rather than differences in food form.

Fish protein is well known for its high biological value due to its complete essential amino acid profile and high digestibility. Adequate availability of essential amino acids is crucial for supporting protein synthesis, tissue growth, and cell repair, particularly in undernourished children who require increased protein intake to support catch-up growth. Thus, fish consumption as an animal-source protein can serve as an effective strategy to improve dietary protein quality in young children (Delmi et al., 2022).

The findings of this study also show that both fried jelawat fish and jelawat fish soup were equally effective in improving protein intake among undernourished children, and there was no difference between the two groups . This can be explained by the standardization of protein content in each serving, despite differences in raw material amounts, namely 79 grams for fried jelawat fish and 121 grams for jelawat fish soup. The portion adjustment was carried out to ensure equal protein content per serving, resulting in comparable protein intake across both intervention groups.

These results are consistent with previous studies by Atasasih et al. (2023), which reported that fish-based supplementary food products can be utilized as local food sources rich in protein and have the potential to support nutritional adequacy in children. Similarly, Ilham et al. (2025) demonstrated that the addition of fish in formulated food products significantly increases protein content and contributes to meeting protein requirements in children with nutritional problems. Overall, jelawat fish has potential as a local animal-source food that can be used as a supplementary feeding option to increase protein intake in undernourished children. In addition to being locally available, jelawat

fish can be processed into various acceptable food forms for children, making it a practical and sustainable food-based intervention to support nutritional improvement programs.

Effect of Jelawat Fish Supplementation on Body Weight

Body weight is a sensitive anthropometric indicator used to reflect short-term changes in nutritional status. An increase in body weight occurs when energy and nutrient requirements, particularly protein and fat, are adequately fulfilled, resulting in a positive energy balance that supports tissue growth in children. In this context, protein functions as a building nutrient for tissue synthesis and repair, while energy and fat serve as primary energy sources, allowing protein to be efficiently utilized for growth processes (Almatsier, 2019; Hardinsyah & Supariasa, 2017). The findings of this study indicate an increase in body weight among children who received jelawat fish supplementation, while the control group tended to show no improvement and even a decline in some cases. This condition suggests that without additional nutrient intake from the intervention, energy and protein adequacy depends solely on daily dietary patterns, which may be insufficient to meet the growth needs of undernourished children.

The decrease in body weight observed in the control group can be explained by an imbalance between energy intake and physiological requirements. When dietary energy and protein intake are inadequate, the body utilizes stored energy reserves to maintain basic metabolic functions, which may lead to weight loss (Agung et al., 2023). This highlights the importance of supplementary feeding interventions in improving the nutritional status of undernourished children. The observed weight gain in the intervention groups is closely related to the improvements in energy, fat, and protein intake discussed previously. Adequate energy intake allows dietary protein to be used optimally for tissue growth rather than being diverted as an alternative energy source. Conversely, when energy intake is insufficient, protein is catabolized for energy needs, thereby limiting its availability for growth and tissue development (Ilham et al., 2017; Kusumaatmaja et al., 2025). Therefore, the balanced intake of energy, protein, and fat provided through jelawat fish supplementation contributed to the increase in body mass, as reflected in body weight gain.

From a physiological perspective, jelawat fish as a high-quality animal protein source provides essential amino acids required for tissue synthesis, muscle growth, and cellular repair. In addition, its fat and energy content helps meet daily energy requirements, allowing protein to be utilized more efficiently for growth processes (Aryana et al., 2022). This makes fish consumption a potential strategy to support weight gain in undernourished children. The findings of this study are in line with the research conducted by Herlina et al. (2025), which showed that the administration of snakehead fish meatballs had an effect on increasing body weight and improving the nutritional status of undernourished children after the intervention. This study is also supported by Herlika et al. (2026), which reported that the provision of fish sausage made from catfish combined with moringa leaves at a dose of 75 grams per day for 14 days had a significant effect on increasing the body weight of undernourished children. Overall, this study demonstrates that jelawat fish has potential as a locally available animal-source food that can be used as a supplementary feeding option to support weight gain in undernourished children. In addition to being easy to obtain and process into various food forms such as fried or soup preparations, jelawat fish may serve as a sustainable food-based intervention to improve child nutritional status.

CONCLUSION

Supplementation with jelawat fish (Leptobarbus hoevenii) for 14 days significantly improved energy, fat, and protein intake, as well as body weight, among undernourished children under five. Improvements were observed in both the fried jelawat fish and jelawat fish soup groups, whereas no meaningful changes were found in the control group. No significant difference in effectiveness was identified between the two preparation methods, indicating that both can be utilised as alternative supplementary feeding strategies. Therefore, jelawat fish has considerable potential to be developed

as a locally available real-food intervention that is acceptable, accessible, and capable of supporting nutritional improvement programmes for undernourished children.

REFERENCES

Agung, A., Agung, I., Pradnyani, A., Agung, I. G., Widarti, A., & Sukraniti, D. P. (2023). Hubungan Tingkat Konsumsi Energi Protein , Pemberian ASI Eksklusif dan BBL Dengan Status Gizi Balita. Jurnal Ilmu Gizi, 12(4), 263–273.

Allo, A. S., Marmina, M., Alim, A., & S, A. M. (2023). Studi Analitik Asupan Zat Gizi Makro Dengan Status Gizi Pada Batita. Jurnal Surya Muda, 5(2), 175–198. https://doi.org/10.38102/jsm.v5i2.281

Almatsier, S. (2019). Prinsip dasar ilmu gizi. Jakarta: Gramedia Pustaka Utama.

Ambeng, Q. R., Yuliani, N. N. S., & Balyas, A. B. (2024). Pengaruh Lama Waktu Penggorengan (Frying Pan) terhadap Kadar Lemak Ikan Seluang (Rasbora sp .). Jurnal Riset Mahasiswa, 2(1), 53–57. https://doi.org/10.37304/barigas.v2i1.10338

Aryana, R., Syamsul, M., Masithah, S., Nurcahyani, I. D., Metode, B., & Sampel, P. (2022). Pengaruh Pemberian Nugget Ikan Bandeng (Chanos Chanos) Terhadap Status Gizi Kurang Pada Balita Usia 1-5 Tahun Program Studi S1 Gizi STIKes Salewangang Maros. Jurnal Ilmiah Kesehatan Diagnosis, 17, 109–115.

Atasasih, H., Paramita, I. S., & Rahayu, D. (2023). Kandungan Gizi serta Sensori Nugget Ikan Patin dengan Penambahan Tempe Sebagai Alternatif Makanan Tambahan Balita dalam Upaya Pencegahan Stunting Nutritional Contents and Sensory of Patin Nuggets with the Addition of Tempe as an Alternative Food for Toddl. Jurnal Kesehatan Komunitas, 9(November), 477–484.

Bustami, Suryana, Junita, D., & Yunianto, A. E. (2023). Fish-Based Complementary Feeding Practices Increasing Macro and Micro Nutrition Intake and Hemaglobin Levels in Anemia Toddlers. 18(3), 175–181.

Cintya, H., Si, S., Robert, D., Kes, M., & Harikedua, V. T. (2025). Gizi dalam Siklus Kehidupan. Media Pustaka Indonesia.

Ciptawati, E., Budi, I., Oktiyani, H., & Alvionita, M. (2021). Analisis Perbandingan Proses Pengolahan Ikan Lele terhadap Kadar Nutrisinya. Indonesian Journal of Chemical Analysis, 04(01), 40–46.

Delmi, Z. I., Nazarena, Y., & Palembang, P. K. (2022). Efek Pemberian Formula Tepung Mocaf, Kacang Merah Dan Ikan Bandeng Untuk Balita Gizi Kurang Di Puskesmas Sabokingking The Effect Of Giving Mocaf, Red Bean, And Milkfish Flour Formula For Undernutrition Children At Sabokingking Health Centre. Jurnal Gizi Dan Kesehatan, 2(2), 176–185.

Dinas Kesehatan Kabupaten Balangan. (2025). Profil data balita gizi kurang Kabupaten Balangan tahun 2025. Balangan: Dinas Kesehatan Kabupaten Balangan.

Fadilasari, A. R., Runjati, R., & Ramlan, D. (2024). Pengaruh Formulasi Sosis Ikan Kembung Dan Kacang Tanah Terhadap Berat Badan Pada Batita Gizi Kurang. 2, 306–312.

Hardiana, Y., Nugraeni, D. K., Riyanto, A., Jenderal, U., & Yani, A. (2024). Efektivitas Konsumsi Ikan Lele Sebagai Alternatif Pemberian Makanan Tambahan (PMT) Untuk Anak di Bawah Usia 3 Tahun. Jurnal Riset Gizi, 12(2), 233–239.

Hardinsyah, & Supariasa, I. D. N. (2017). Ilmu gizi: Teori dan aplikasi. Jakarta: Penerbit EGC.

Herlika, W., Podojoyo, Mardiana, Sartono, & Yulianto. (2026). Pemberian Sosis Ikan Patin dan Daun Kelor sebagai Intervensi Peningkatan Berat Badan pada Balita Underweight. Media Pangan Gizi, 33, 5–8.

Herlina, Simatupang, M., & Aritonang, M. F. (2025). Pengaruh Pemberian PMT Bakso Ikan Gabus terhadap Status Gizi Balita Gizi Kurang (BB/U) Usia 24-59 Bulan di Wilayah Kerja UPT Puskesmas Pintu Angin Kota Sibolga. Jurnal Penelitian Dan Pengkajian Ilmiah, 2(7), 1198–1204.

Ilham, Oktorina, S., Rizki, M., & As, H. (2017). Hubungan Asupan Energi dan Protein Terhadap Indeks Massa Tubuh Mahasiswa Studi Kasus pada Mahasiswa UIN Sunan Ampel Surabaya

The Relation Pattern Between Energy and Protein Intake Against Student ' s Body Mass Index Case Study at UIN Sunan Ampel Surabaya. 1(2), 97–106.

Ilham, V. R., Dewi, Z., Andrestian, M. D., & Syainah, E. (2025). Formulasi Odeng dari Ikan Bandeng (Chanos Chanos) Sebagai Produk Alternatif Tinggi Protein dan Kalsium untuk Balita Stunting. Jurnal Kesehatan Tambusai, 6(September), 13281–13293.

Kementerian Kesehatan Republik Indonesia. (2020). Standar Antropometri Anak. 3, 1–78.

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 RI

Izah, N., Desi, N. M., & Tegal, P. M. (2024). Efektivitas Konsumsi Protein Hewani (Telur dan Ikan) sebagai Strategi Penuntasan Stunting. Jurnal Ilmiah Kebidanan Imelda, 9(2), 66–70.

Kusumaatmaja, D. K., Listyani, H., & Siti, Z. (2025). Hubungan antara Asupan Energi, Protein, dan Lemak dengan Status Gizi Pada Remaja Putri di Kota Surakarta. Jurnal Kesehatan Masyarakat, 9(April), 2764–2771.

Lestari, E. S., Irawan, A. M., & Musta'in. (2024). Hubungan Pengetahuan Asupan Protein dengan Kejadian Stunting Balita Usia 2-5 Tahun. Journal of Health Research Science, 4(2), 311–319.

Malkan, I., Ilmi, B., Khomsan, A., Marliyati, S. A., Masyarakat, D. G., Manusia, F. E., & Bogor, I. P. (2017). Kualitas Minyak Goreng dan Produk Gorengan Selama Penggorengan di Rumah Tangga Indonesia. 4(2), 61–65. https://doi.org/10.17728/jatp.2015.12

Nasution, A. P., Reswari, A., Aspah, A., Anggraeni, Z., Jahrona, J., & Fatimah, P. S. (2024). Peran Gizi Terhadap Pertumbuhan dan Perkembangan Anak Usia Dini. Indonesian Journal of Islamic Early Childhood Education Education, 9(2), 1–10.

Nayak, B. S., Unnikrishnan, B., Shashidhara, Y. N., & Mundkur, S. C. (2023). Effect of nutrition intervention on cognitive development among malnourished preschool children : randomized controlled trial. Scientific Reports, 1–8. https://doi.org/10.1038/s41598-023-36841-7

Nurhayati, H. S., Jayatmi, I., & Pangestu, G. K. (2024). Efektifitas Pemberian Nugget Tempe Kedelai dan Nugget Ikan Tuna terhadap Peningkatan Berat Badan Pada Balita Gizi Kurang di PMB Ny.H Kabupaten Tasikmalaya Tahun 2024. Journal of Innovation Research and Knowledge, 4(6), 3893–3904.

Pranindita, S. K., & Cahyati, W. H. (2022). Stunting pada Balita Usia 24-59 Bulan. HIGEIA (Journal of Public Health Research and Development), 6(4), 191–202.

Puady, A., & Sartika, A. N. (2024). Hubungan Frekuensi Konsumsi Ikan dan Asupan Protein Hewani dengan Kejadian Stunting pada Balita di Wilayah Puskesmas Pulau Panggang Kepulauan Seribu. 5(September), 8359–8369.

Rahayu, P. P., & Casnuri. (2022). Mencukupi Status Gizi Anak dengan Gerakan Aksi "Aku Suka Makan Ikan." Journal of TSCNers, 7(1).

Sari, D. I., & Sari, I. P. (2022). Stunting dan Perkembangan Balita Usia 36-59 Bulan di Jakarta dan Papua. Nutri-Sains: Jurnal Gizi, Pangan, Dan Aplikasinya, 6(2), 113–124. https://doi.org/10.21580/ns.2022.6.2.9183

Sholikhah, A., & Dewi, R. K. (2022). Peranan Protein Hewani dalam Mencegah Stunting pada Anak Balita. Jurnal Riset Dan Teknologi, 6(1), 95–100.

Silaban, A. P., Hasan, B., & Leksono, T. (2017). Karakteristik Fisikokimia Dan Sensoris Daging Ikan Jelawat (Leptobarbus Hoevenii) Dari Ukuran Berbeda. Universitas Riau, 1–9.