Contents lists available at IOCS

Science Midwifery

journal homepage: www.midwifery.iocspublisher.org

The utilization of mackarel tuna as Nutrient-Dense Complementary Food (MPASI)

Tiara Nanda Puspita Tanjung[1], Eliska[2], Nadya Ulfa Tanjung[3]
[1,2,3]Faculty of Public Health, State Islamic University of North Sumatra, Medan

ARTICLE INFO

Article history:

Received Jun 28, 2024
Revised Jun 29, 2024
Accepted Jul 5, 2024

Keywords:

Complementary Feeding
Nugget
Protein
Tuna

ABSTRACT

This study explores the potential of mackerel tuna as a nutritious complementary food source (MPASI) due to its rich protein content and high availability, which could play a crucial role in a balanced diet for toddlers. The aim of this research is to investigate the potential of mackerel tuna as a protein source in nutritious complementary foods for breastfeeding infants. This study employs experimental and observational methods to evaluate the potential of mackerel tuna as a complementary food. The results are analyzed descriptively, and protein content analysis is conducted on mackerel tuna nuggets. The research is carried out in three stages: recipe creation, recipe modification trials, and protein content testing. Protein content analysis, conducted at the Biochemistry Laboratory of FMIPA, Universitas Sumatera Utara, using spectrophotometry on mackerel tuna nugget samples, showed a protein content of 0.35 grams per gram, indicating 35 grams of protein in 100 grams of nuggets. Processed mackerel tuna in the form of nuggets represents a promising variation of MPASI menu rich in protein content. Protein is crucial for supporting the growth and development of toddlers as it is a primary nutrient essential for physical growth, including bone and muscle development. Additionally, protein plays a role in brain development, enhancing cognitive function in toddlers.

Corresponding Author:

Tiara Nanda Puspita Tanjung,
Public Health, Faculty of Public Health,
State Islamic University of North Sumatra,
Medan, Indonesia.
Email: tiaranandapuspita@gmail.com

INTRODUCTION

Exclusive breastfeeding ends when the baby reaches 6 months of age, at which point the baby is introduced to solid foods to meet nutritional needs and support growth in the next phase (Prabawani, 2021). Complementary feeding for infants aged 6 to 24 months should be adjusted according to the baby's digestive capacity and Nutritional Adequacy Rate (AKG), selecting foods that support growth without posing health risks (Masdarwati et al., 2023). Ideal complementary foods for breastfeeding are nutrient-rich, easily digestible, appealing, appetite-stimulating, free from harmful substances, low in sugar and salt, without flavor enhancers, and affordable (Jumria Talamma et al., 2023).

Nutritional balance plays a crucial role in supporting a child's development and life during the first five years (Ramadhan, 2024). Failure to meet nutritional needs during this period can hinder a child's growth and development (Nuryuliasih & Sumanto, 2024). A child's physical growth that is not in line with their age may reflect malnutrition, which could have impacts in adulthood (R. D. P. Utami, 2020).

This study explores the potential of tongkol fish as a nutrient-dense complementary food (MPASI), given its rich protein content and high availability. Tongkol fish has great potential to become an essential part of a balanced toddler diet. However, in the context of complementary feeding, tongkol fish is often overlooked or underutilized. In addition to being inexpensive and easily accessible, especially in coastal areas, it is important to delve deeper into the utilization of tongkol fish as a nutrient-dense complementary food that meets toddlers' nutritional needs (Diniarti et al., 2020).

Tongkol fish, scientifically known as "Auxis thazard," belongs to the Scombridae family. This type of fish is commonly found in tropical and subtropical waters around the world(Farianti et al., 2015). Tongkol fish typically has an aerodynamic body and can swim quickly, belonging to the same family as tuna (Pandit, 2022).

In this study, complementary food (MPASI) made from tongkol fish as the main ingredient and local food ingredients such as corn processed into nuggets was developed. This food has been designated as a superfood due to its high nutritional value. Its complete nutritional content is very beneficial in supporting optimal growth and development during the toddler phase.

RESEARCH METHOD

This study employs experimental and observational methods to evaluate the potential of tongkol fish as a complementary food to breast milk. The results were analyzed descriptively, and protein content analysis was conducted on tongkol fish nuggets.

The study aims to investigate the potential of tongkol fish as a protein source in nutritious complementary foods for infants. The research was conducted in two stages: recipe development and protein content testing. The recipe development for complementary food (MPASI) was carried out on January 10, 2024, at the author's residence (Jl. Pancasila Tanah Tinggi). The protein content testing was conducted on April 1, 2024, at the Biochemistry Laboratory of FMIPA USU.

The ingredients used in making the nuggets were tongkol fish (1000 grams), corn (500 grams), tapioca flour (250 grams), wheat flour (100 grams), garlic (4 cloves), shallots (5 cloves), scallions/celery (to taste), eggs (2 pieces/100 grams), breadcrumbs (200 grams), and salt (to taste). The preparation process involved blending all the ingredients (tongkol fish, corn, garlic, shallots), adding tapioca flour and a little wheat flour. The mixture was then shaped and steamed for approximately 15 minutes. Once cooked, the mixture was coated with beaten eggs and rolled in ground breadcrumbs, then cooked over medium heat until golden brown. This recipe yields 91 nuggets, each weighing 25 grams.

The protein content in tongkol fish is 28 grams per 100 grams. In the nugget preparation, corn was used as a binding agent that helps provide the desired texture and consistency. Corn also contains 9.8 grams of protein per 100 grams, which can slightly increase the protein content of the nuggets, and serves as a carbohydrate source. When combined with the protein from tongkol fish, it contributes to a balanced meal (Syukur et al., 2023).

RESULTS AND DISCUSSIONS

The type of fish used in the production of Complementary Feeding is tongkol fish. The use of local food ingredients from tongkol fish can create Complementary Feeding with a high protein content, which is excellent for increasing protein intake in toddlers. Tongkol fish is a type of pelagic fish. In

100 grams, this fish contains 25.00% protein, 0.03% carbohydrates, 1.50% fat, 2.25% minerals, and 69.40% water. The complete composition of amino acids in tongkol fish protein is crucial for the body.

Protein Content In The Nugget

Table 1. Protein content in the nugget

Product name	Protein content (%)	Unit
Nugget	0,35	gr/1gr

The protein content analysis conducted at the Biochemistry Laboratory, Faculty of Mathematics and Natural Sciences, Universitas Sumatera Utara, using spectrophotometry method on tongkol fish nugget samples, resulted in 0.35 grams per 1 gram, indicating that there is 35 grams of protein content per 100 grams of nuggets. The formula used for calculation is:

$$\%N \frac{(VHCl - Vblanko) x\ NHCl\ x\ 14{,}008}{Sample\ weight\ (mg)} x\ 100\%$$

$$\%P = \%\ x\ Fk$$

$$\%N \frac{(0{,}45\ ml - 0{,}05\ ml) x\ 0{,}1\ N\ x\ 14{,}008}{1001\ mg} x\ 100\%$$

$$\%N = 0{,}0560\%$$

$$\%P = 0{,}0560\%\ x\ 6{,}25$$

$$\%P = 0{,}35\%$$

The production of tongkol fish nuggets is one effort in providing complementary food for toddlers as a means to support their nutritional needs for growth and development. Laboratory testing revealed a protein content of 35 grams per 100 grams of nuggets, indicating a high protein content in 100 grams of nuggets.

Discussion

Based on the Regulation of the Minister of Health of the Republic of Indonesia Number 28 of 2019 concerning Nutritional Adequacy Rates (AKG), the recommended amount of protein for toddlers is between 18 to 35 grams per day (Kemenkes, 2019). The protein needs of toddlers can be met through the consumption of complementary foods (MPASI) and breast milk (Qothrunnada R., 2023).

Protein is an essential nutrient for the body, functioning as a building and regulatory substance. Additionally, protein is a source of amino acids that contain carbon (C), hydrogen (H), oxygen (O), and nitrogen (N), elements not found in fats or carbohydrates (Natsir, 2018). Protein is one of the macronutrients and, unlike other macronutrients such as carbohydrates and fats, plays a more crucial role in the formation of biomolecules and body structures than as an energy source (Khasanah & Mumpuni, 2021).

Protein is vital for supporting the growth and development of toddlers. As a primary nutrient, protein is necessary for the physical development of toddlers, particularly in the growth of bones and muscles (Sholikhah & Dewi, 2022). Protein is also required for the development of brain function, which in turn can enhance the cognitive abilities of toddlers (Nurhidayati et al., 2023). Here are some of the main functions of protein for toddlers:

Growth and Development

Protein is a building block for body cells, including muscles, bones, skin, and other tissues. It aids in optimal growth and development during the toddler phase (Primasoni, 2018).

Immune System Strengthening

Protein plays a crucial role in forming antibodies and enzymes that support the immune system of infants and toddlers. This helps protect against infections and diseases (Ode, 2013).

Maintenance and Repair of Tissues

Protein is needed for the maintenance and repair of body tissues that are damaged or undergo wear and tear due to daily activities or minor injuries (H. D. Utami et al., 2020).

Cognitive Function

Protein is also essential for brain development and cognitive function. Adequate nutrition, including sufficient protein intake, can support cognitive abilities and mental development in toddlers (Rukhil Amania et al., 2022).

Energi

Although carbohydrates and fats are more commonly considered the primary energy sources, protein can also be used as an alternative energy source when carbohydrates and fats are not available in sufficient amounts (Sholikhah & Dewi, 2022).

Tongkol fish is rich in omega-3 fatty acids, such as EPA (eicosapentaenoic acid) and DHA (docosahexaenoic acid), which are essential for brain and nervous system development in toddlers. These fatty acids help maintain heart health, support immune function, and aid in the absorption of several vital nutrients, including fat-soluble vitamins such as A, D, E, and K. This supports healthy growth and development in toddlers and helps them maintain stamina and engage in daily activities (Pambudi et al., 2021). The flesh of this fish also contains minerals such as magnesium, calcium, iodine, phosphorus, fluorine, iron, zinc, and selenium. Additionally, it is rich in omega-3 and omega-6 fatty acids, which are beneficial for heart muscles, brain intelligence, and preventing blood clots (Lalu Ali Wardana et al., 2022).

Besides its high protein content, tongkol fish offers other benefits, including the presence of vitamin C. Vitamin C is essential for forming and maintaining body tissues and is crucial for the health of gums, teeth, skin, and bones in toddlers. It also plays a vital role in collagen formation, which is the main structural protein in the body (Ajeng Pm Subagio, 2021). Collagen is a key component of connective tissues, including skin, bones, blood vessels, and tendons. Vitamin C helps maintain body health and strength by supporting the formation and maintenance of these proteins (Wijaya & Gozali, 2021).

The protein found in tongkol fish also aids in iron absorption. Protein molecules like transferrin and lactoferrin help transport iron into body cells and prevent infections (Anissa & Dewi, 2021). Additionally, protein is involved in the formation of hemoglobin, which carries oxygen from the lungs to all body tissues and returns carbon dioxide from body cells to the lungs for exhalation. Thus, protein not only helps in iron absorption but also in its transportation and utilization within the body.

The social impact of this research lies in its potential to address nutritional challenges faced by infants and children, especially in communities with limited access to diverse and nutritious foods. By exploring the utilization of tongkol fish as a complementary food to breast milk, this study offers a sustainable and cost-effective solution to enhance the nutritional intake of children: Improving Nutrition: Introducing tuna fish nuggets as complementary food can contribute to improving the nutritional status of infants, ensuring they receive essential nutrients crucial for their growth and development.

Economic Empowerment: Utilizing locally available and affordable food sources such as tuna fish can economically empower communities by promoting local industries and reducing dependency on imported foods.

Health Awareness: This research raises awareness among caregivers and health professionals about the nutritional value of alternative food sources like tuna fish, potentially leading to healthier dietary practices for infants and children.

Sustainable Food Practices: By promoting the use of tuna fish, which is often abundant and underutilized, this research encourages sustainable food practices that efficiently utilize local resources, reduce food waste, and enhance food security.

CONCLUSION

From the research conducted, it can be concluded that the nutritional value of tongkol fish nuggets significantly aids in the growth and development of toddlers due to the high protein content in these complementary foods (MPASI). Tongkol fish processed into nuggets serves as a pioneer for a variety of protein-rich MPASI menus. Protein is crucial for supporting the growth and development of toddlers as it is the primary nutrient needed for physical growth, including bones and muscles. Additionally, protein is essential for brain development, which can enhance toddlers' cognitive functions.

Based on this research, it is recommended to continue developing the formulation of tongkol fish nuggets as a complementary food to breast milk to optimally meet the nutritional needs of toddlers.

References

Farianti, L., Irawan, H., & Pratomo, A. (2015). Pola Hubungan Antara Jenis Anemon Dengan Ikan Badut (Amphiprioninae) Di Perairan Daerah Pulau Pucung Kabupaten Bintan Provinsi Kepulauan Riau. *Repository UMRAH*.

Ajeng Pm Subagio, A. E. D. (2021). Hubungan Konsumsi Suplemen Mikronutrien Terhadap Kejadian Infeksi Saluran Pernafasan, 2021. *Jurnal Ilmiah Maksitek*, *6*(2), 59–66.

Anissa, D. D., & Dewi, R. K. (2021). Peran Protein: ASI dalam Meningkatkan Kecerdasan Anak untuk Menyongsong Generasi Indonesia Emas 2045 dan Relevansi Dengan Al-Qur'an. *Jurnal Tadris IPA Indonesia*, *1*(3), 427–435. https://doi.org/10.21154/jtii.v1i3.393

Diniarti, N., Cokrowati, N., Setyowati, D. N., & Mukhlis, A. (2020). Edukasi Nilai Gizi Ikan Melalui Pelatihan Pembuatan Makanan Olahan Berbahan Baku Ikan Tongkol. *Abdi Insani*, *7*(1), 49–54. https://doi.org/10.29303/abdiinsani.v7i1.300

Jumria Talamma, Tini, & Elisa Goretti Sinaga. (2023). The Relationship of Knowledge and Socio Culture of Mothers to Exclusive Breast Feeding in Aid Community Health Center Lebaho Ulaq Village. *Formosa Journal of Applied Sciences*, *2*(11), 2987–3030. https://doi.org/10.55927/fjas.v2i11.6671

Kemenkes. (2019). Peraturan Menteri Kesehatan RI No 28 tahun 2019 tentang angka kecukupan gizi yang dianjurkan untuk masyarakan indonesia. In *Peraturan Menteri Kesehatan RI No 28 tahun 2019* https://peraturan.bpk.go.id/details/138621/permenkes-no-28-tahun2019

Khasanah, T. A., & Mumpuni, C. E. (2021). Pengaruh Formulasi Tepung Ikan Haruan, Tepung Buah Dan Biji Labu Kuning Pada Biskuit Terhadap Kandungan Gizi Dan Daya Terima. *Journal of Nutrition College*, *10*(1), 1–9. https://doi.org/10.14710/jnc.v10i1.28486

Lalu Ali Wardana, Dina Sabrina, Ida Bagus Yoga Mahendra, Juni Ningsih, Johanul Arifin, M. Sahril Hamdu, Maulidatul Hasanah, Menariatun, Nurfitriyanti Handayani, Rosliana Hakim, & Sri Wahyuni. (2022). Nugget Ikan Tongkol Sebagai Makanan Pendukung dalam Upaya Pencegahan Stunting di Desa Padamara. *Jurnal Pengabdian Magister Pendidikan IPA*, *4*(3), 136–139. https://doi.org/10.29303/jpmpi.v4i3.2017

Masdarwati, M., Kadir, E., Serli, S., Ruben, S. D., Pannyiwi, R., & Rante, A. (2023). Penyuluhan Tentang Makanan Pendamping Asi Dengan Status Gizi Balita. *Sahabat Sosial: Jurnal Pengabdian Masyarakat*, *1*(2), 40–42. https://doi.org/10.59585/sosisabdimas.v1i2.28

Natsir, N. A. (2018). Analisis Kandungan Protein Total Ikan Kakap Merah Dan Ikan Kerapu Bebek. *Biosel: Biology Science and Education*, *7*(1), 49. https://doi.org/10.33477/bs.v7i1.392

Nurhidayati, N., Herodya L Fesmia, Lendi Leskia Putri, & Ni Kadek Mega Suryantini. (2023). Nutrisi Pada 1000 Hari Pertama Kehidupan (HPK) Sebagai Dasar Perkembangan Kognitif : Sebuah Kajian Pustaka. *Unram Medical Journal*, *12*(3). https://doi.org/10.29303/jku.v12i3.987

Nuryuliasih, S., & Sumanto, R. P. A. (2024). Pengaruh status gizi anak terhadap perkembangan bahasa ekspresif anak usia 2-3 tahun di Kelurahan Tamanwinangun Kabupaten Kebumen. *Jurnal Warna : Pendidikan Dan Pembelajaran Anak Usia Dini*, *9*(1), 78–90. https://doi.org/10.24903/jw.v9i1.1449

Ode, I. (2013). Kajian sistem imunitas untuk pengendalian penyakit pada ikan dan udang. *Agrikan: Jurnal Agribisnis Perikanan*, *6*(2), 41–43. https://doi.org/10.29239/j.agrikan.6.2.41-43

Pambudi, T. A., Danuwari, L., Fauzi, A., & Yuniarti, S. (2021). Pemanfaatan Ikan Tongkol (Euthynnus Sp.) Dalam Pembuatan Mie Sebagai Upaya Peningkatan Ekonomi Kreatif. *Jurnal Masyarakat Mandiri*, *5*(2), 596–605.

Pandit, I. G. S. (2022). *Morfologi Dan Identifikasi Ikan*. Repository Universitas Warmadewa.

Prabawani, Y. (2021). Uji Daya Terima dan Nilai Gizi Makanan Pendamping ASI (MPASI) Berbahan Pangan Lokal di Posyandu Wilayah Kerja Puskesmas Sidosermo Kota Surabaya. *Cakrawala*, *15*(2), 153–162. https://doi.org/10.32781/cakrawala.v15i2.358

Primasoni, N. (2018). Manfaat Protein untuk Mendukung Aktifitas Olahraga, Pertumbuhan, dan Perkembangan Anak Usia Dini. In *Analytical Biochemistry* (Vol. 11, Issue 1).

Qothrunnada R., M. (2023). *PERBANDINGAN KENAIKAN BERAT BADAN BAYI PADA MP-ASI INSTANT*. *11*(1), 56–62.

Ramadhan, F. (2024). Peranan gizi dalam pencegahan penyakit tidak menular. *Vitamin : Jurnal Ilmu Kesehatan Umum*, *2*(3), 49. https://doi.org/https://doi.org/10.61132/vitamin.v2i3.431

Rukhil Amania, Muhammad Nur Hidayat, Izatul Hamidah, Endah Wahyuningsih, & Asnun Parwanti. (2022). Pencegahan Stunting Melalui Parenting Education Di Desa Pakel Bareng. *Jurnal Pengabdian Masyarakat Darul Ulum*, *1*(1), 52–68. https://doi.org/10.32492/dimas.v1i1.566

Sholikhah, A., & Dewi, R. K. (2022). Peranan Protein Hewani dalam Mencegah Stunting pada Anak Balita. *JRST (Jurnal Riset Sains Dan Teknologi)*, *6*(1), 95. https://doi.org/10.30595/jrst.v6i1.12012

Syukur, A., Natalia Besi, D. I., Lolon, A. W. B., Pareira, M. I. R., Klau, E. R., Sogen, Y. K., & Selly, F. K. (2023). Pengenalan Jagung Solor Sebagai Upaya Pencegahan Stunting. *Kelimutu Journal of Community Service*, *3*(2), 1–6. https://doi.org/10.35508/kjcs.v3i2.12279

Utami, H. D., Kamsiah, K., & Siregar, A. (2020). Hubungan Pola Makan, Tingkat Kecukupan Energi, dan Protein dengan Status Gizi pada Remaja. *Jurnal Kesehatan*, *11*(2), 279. https://doi.org/10.26630/jk.v11i2.2051

Utami, R. D. P. (2020). Pola Pemberian Makan, Pemberian Asi Eksklusif, Asupan Protein Dan Energi, Sebagai Penyebab Stunting Di Desa Grogol Ponorogo. *Jurnal Keperawatan Malang*, *5*(2), 96–102. https://doi.org/10.36916/jkm.v5i2.114

Wijaya, W. P., & Gozali, T. (2021). PENAMBAHAN KOLAGEN SISIK DAN TULANG IKAN GURAMI (Osphronemus goramy) PADA MINUMAN JUS JAMBU BIJI (Psidium guajava). *Pasundan Food Technology Journal*, *8*(1), 12–19. https://doi.org/10.23969/pftj.v8i1.3899