



---

## The Influence of Consumption of Mackerel Nugget on Changes in Anthropometric Status of Stunting Toddler in Rembang Health Center

---

<sup>K</sup>Evi Susiyanti<sup>1</sup>

<sup>1</sup>Akademi Kebidanan Sakinah Pasuruan Indonesia

Email Corepondence author (<sup>K</sup>): [evisusiyanti703@gmail.com](mailto:evisusiyanti703@gmail.com)

---

### ABSTRACT

One of the nutritional problems experienced by Indonesian people is stunting. Stunting is a very serious nutritional problem where the impact of stunting can occur in the short term or long term. The consequences of stunting can increase morbidity and mortality during infancy, lower psychological cognitive function during school years. One real community-based effort that can be made to accelerate overcoming the problem of stunting is by implementing nutritional interventions through a food diversification program from mackerel in the form of nuggets. The aim of this research is to analyze the effect of consuming mackerel nuggets on changes in the anthropometric status of stunted toddlers at the Rembang Community Health Center. This research uses a pre-experimental research design with a one group pre-post test design. The samples in this study were some stunted toddlers in the work area of the Rembang Health Center, Pasuruan Regency who met the research criteria, consisting of 30 respondents. The sampling technique used is probability sampling with simple random sampling. The data analysis test was carried out using the Wilcoxon sign rank test. From the results of research data analysis, it can be concluded that there is an influence of consumption of mackerel nuggets on changes in the anthropometric status of stunted toddlers with an Asymp Sig (2-tailed) value of  $0.000 < \text{significance } \alpha (0.05)$ . The use of mackerel fish which is processed in the form of nuggets, can be used as an alternative in providing complementary food to stunted toddlers. Food diversification is the key to success in increasing the appetite of stunted toddlers, where by increasing the appetite experienced by toddlers, the problem of stunting will be easier to solve.

Keywords: Nugget; Mackerel Fish; Toddlers; Stunting

---

#### *Article history :*

*Received: 1 Agustus 2024*

*Received in revised form: 19 September 2024*

*Accepted: 19 Oktober 2024*

*Available online: 15 Desember 2024*



Licensed by [Creative Commons Attribution-ShareAlike 4.0 International License](https://creativecommons.org/licenses/by-sa/4.0/).

---

---

## INTRODUCTION

Health development in Indonesia, adopted from SDGs 2030 (Sustainable Development Goals), is a development target that must be achieved by Indonesia in 2030.<sup>1</sup> One of the targets of the 2030 SDGs in Indonesia is also implemented in the health sector where the goal of health development is to ensure a healthy life and promote well-being for all people at all ages. There are 38 SDGs targets in the health sector that need to be realized in addition to problems that have not been resolved, including efforts to reduce maternal mortality rates (MMR) and infant mortality rates (IMR), control of HIV/AIDS, Tuberculosis, Malaria, deaths due to NCDs (Non-Communicable Diseases) and increasing access to reproductive health (including KB).<sup>2</sup> One of the classic health problems experienced by many countries related to health is the occurrence of stunting. Stunting in toddlers is characterized by a child's height being too short for their age which is caused by chronic malnutrition over a fairly long period of time.<sup>3</sup> This stunting condition is sometimes considered as a normal condition by people in Indonesia as long as the toddler they have is not sick, then the child's height is too short for his age is not a significant problem. This is what makes the problem related to stunting in Indonesia increasingly difficult to overcome properly

The World Health Organization reported that the prevalence of stunting in the world in 2021 reached 22.5 percent or around 150.9 billion toddlers worldwide experienced stunting. This condition decreased in 2022 where the incidence of stunting was reported to be experienced by around 22.3 percent or around 148.1 billion toddlers worldwide experiencing stunting.<sup>4</sup> The Ministry of Health of the Republic of Indonesia reported that the trend in the nutritional status of toddlers in Indonesia who experienced stunting in 2019 was 27.7 percent, in 2021 it decreased to 24.4 percent and in 2022 it decreased again to 21.6 percent. For the East Java region, the number of stunted toddlers was reported to have reached 19.2 percent.<sup>5</sup> Based on the Stunting Data Publication Information System owned by the Pasuruan Regency Government, as of February 2023, it was reported that out of 87,170 toddlers who underwent anthropometric measurements, 8.81 percent of toddlers experienced stunting. For the Rembang Health Center work area, Pasuruan Regency, it was reported that out of 3,794 toddlers, 195 toddlers (5.14%) experienced stunting.<sup>6</sup> The results of a preliminary study conducted by researchers on 10 mothers of stunted toddlers in the Rembang Health Center, Pasuruan Regency, all said that their toddlers did not experience illness even though their toddlers were too short for their age. The mothers of toddlers also said that the feeding patterns for their toddlers followed the eating patterns and menus consumed by their parents. However, since their toddlers were declared stunted, their toddlers regularly received additional food from the health center

Stunting is a chronic nutritional problem that occurs due to insufficient nutrient intake over a long

---

period of time, resulting in growth disorders characterized by height that is not appropriate for age.<sup>7</sup> Stunting can occur from when the fetus is still in the womb and only appears when the child is two years old. The consequences of stunting can increase morbidity and mortality in toddlers, low psychological cognitive function during school.<sup>8</sup> Stunting can also be detrimental to long-term health and in adulthood can affect work productivity, the risk of obesity and trigger metabolic syndrome, hypertension, coronary heart disease, stroke and type 2 diabetes mellitus.<sup>9</sup> Stunting in toddlers can damage the mental and physical development of toddlers, and affect the intergenerational transmission of malnutrition and poor birth outcomes to the next generation. Stunting is an indicator of inadequate birth and care environments, and is associated with learning challenges and barriers to community engagement. The prevalence and severity of stunting are useful indicators for population assessment and can be used to track the development of children in a population over time.<sup>10</sup>

In an effort to overcome the problem of stunting that occurs in Indonesia, the Indonesian Government has formulated several action plans to overcome the problem of stunting that occurs. This action plan targets two main areas, namely the field of specific intervention and the field of governance.<sup>11</sup> One of the specific intervention areas that is on the agenda for accelerating stunting management is by diversifying local food to overcome stunting problems. One of the local food ingredients that is widely found in Pasuruan Regency is mackerel. Mackerel, which is one of the marine commodities in Pasuruan Regency, is reported to contain 52 percent fat and 48 percent protein in 100 grams of mackerel. Mackerel also contains 19.32 protein, 9.36 grams of total fat consisting of saturated fat (2.4 grams), polyunsaturated fat (2.3 grams) and monounsaturated fat (3.2 grams), 78 milligrams of sodium, 389 milligrams of potassium, and 167 calories of energy.<sup>12</sup> The high nutritional value of mackerel makes mackerel have the potential to be used as an intervention to handle stunting in toddlers. Although mackerel is rich in nutrition, giving mackerel directly to toddlers is a problem in practice. Almost all toddlers often refuse to consume mackerel cooked by their parents as a side dish.<sup>13</sup>

One of the efforts that can be made to ensure that every stunted toddler gets the nutrition and nutrients they need is to diversify food ingredients. Diversification of food ingredients from mackerel in the form of nuggets can be a special attraction for stunted toddlers to consume processed mackerel products.<sup>14</sup> Research conducted by Legi et al (2023) to 30 elementary school students, the average respondent of the study stated that they liked the taste, color, texture and aroma of processed mackerel nugget products. This indirectly shows that diversification of mackerel into processed nuggets can be applied as a specific intervention for toddlers with stunting to ensure adequate nutrition and nutrition needed by toddlers with stunting.

The purpose of this study was to analyze the effect of mackerel fish nuggets consumption on

changes in the anthropometric status of stunted toddlers at the Rembang Health Center

## METHOD

This study used a pre-experimental research design with a one group pre-post test design. The population in this study were all stunted toddlers in the Rembang Health Center, Pasuruan Regency, totaling 195 toddlers. This study involved 30 stunted toddlers in the Rembang Health Center, Pasuruan Regency. In this study, the researcher used a probability sampling method with a simple random sampling type. The independent variable in this study was the provision of mackerel nugget consumption intervention. The dependent variable in this study was the anthropometric status of stunted toddlers (height). The instruments in this study were questionnaires and observation sheets. Data analysis tests were carried out using paired t-tests with a significance of  $\alpha$ : 0.05

## RESULTS

### 1. Anthropometric status of stunted children before the consumption of mackerel nuggets.

Table 1. Characteristics of study respondents based on anthropometric status of stunted children in the working area of Rembang Health Center Pasuruan Regency before the intervention of mackerel fish consumption

No.	Description	Total	Percentage (%)
1	High (threshold (z score) +3 SD)	0	0,0
2	Normal (threshold (z score) -2 SD to +3 SD)	0	0,0
3	Stunted (threshold (z score) -3 SD to < -2 SD)	30	100
4	Severely stunted (z score < -3 SD)	0	0,0
Total		30	100

Source: primary research data

From the research results, it was found that all toddlers in this study had anthropometric status in the short category (stunted) (threshold (z score) -3 SD to < -2 SD), namely 30 respondents (100%), and none of the toddlers in this study had anthropometric status in the high category (threshold (z score) +3 SD), normal (threshold (z score) -2 SD to +3 SD), and very short (severely stunted) (threshold (z score) < -3 SD).

**2. Anthropometric status of stunted children after the consumption of mackerel nuggets.**

Table 2. Characteristics of study respondents based on the anthropometric status of stunted children in the working area of Puskesmas Rembang Kabupaten Pasuruan after being given the mackerel fish consumption intervention.

No.	Description	Total	Percentage (%)
1	High (threshold (z score) +3 SD)	0	0,0
2	Normal (threshold (z score) -2 SD to +3 SD)	5	16,7
3	Stunted (threshold (z score) -3 SD to < -2 SD)	25	83,3
4	Severely stunted (z score < -3 SD)	0	0,0
Total		30	100

Source: primary research data

From the research results, it was found that most toddlers in this study had anthropometric status in the short category (stunted) (threshold (z score) -3 SD to < -2 SD) namely 25 respondents (83.3%), a small number of toddlers in this study had anthropometric status in the normal category (threshold (z score) -2 SD to +3 SD) as many as 5 respondents (16.7%), and none of the toddlers in this study had anthropometric status in the high category (threshold (z score) +3 SD), and very short (severely stunted) (threshold (z score) < -3 SD)

**3. The effect of mackerel tuna consumption on changes in anthropometric status of stunted children**

Table 3. Cross-tabulation of the effect of mackerel tuna consumption on changes in anthropometric status of stunted children in Rembang Health Center Pasuruan Regency

Before and after feeding mackerel nuggets	Normal	Short/stunted	Total
Normal	0 0,0%	0 0,0%	0 0,0%
Short/Stunted	5 16,7%	25 83,3%	30 100%
Total	5 16,7%	25 83,3%	30 100%
Wilcoxon sign rank test	0,000		

Source: primary research data

From the results of data analysis on toddler height (pre-test), the average toddler height was 81.40 cm, with a minimum toddler height of 78 cm and a maximum toddler height of 86 cm. For toddler height (post-test), the average toddler height was 83.16 cm, with a minimum toddler height of 80 cm and a maximum toddler height of 88 cm. From the results of the analysis of changes in toddler anthropometric status, it was found that 5 toddlers experienced changes in anthropometric status, which were originally short (stunted) (threshold (z score) -3 SD to < -2 SD) changing to normal (threshold (z score) -2 SD to +3 SD). From the results of the Wilcoxon sign rank test, the Asymp Sig (2-tailed) value was obtained of 0.000 < significance  $\alpha$  (0.05) so that the research hypothesis was accepted, which means that there is an effect of mackerel fish nugget consumption

on changes in the anthropometric status of stunted toddlers at the Rembang Health Center, Pasuruan Regency

## DISCUSSION

### 1. Anthropometric status of stunted children before the consumption of mackerel nuggets.

From the research results, it was found that all toddlers in this study had anthropometric status in the short category (stunted) (threshold (z score)  $-3$  SD to  $< -2$  SD), namely 30 respondents (100%), and none of the toddlers in this study had anthropometric status in the high category (threshold (z score)  $+3$  SD), normal (threshold (z score)  $-2$  SD to  $+3$  SD), and very short (severely stunted) (threshold (z score)  $< -3$  SD)

Stunting is a chronic malnutrition problem caused by a lack of nutritional intake over a long period of time, this causes disorders in the future, namely experiencing difficulties in achieving optimal physical and cognitive development.<sup>15</sup> Stunted children have a lower Intelligence Quotient (IQ) than the average IQ of normal children.<sup>16</sup> Stunting is defined as a condition where the nutritional status of a child according to height/age with a Z Score value =  $< -2$  SD, this indicates a short or very short body condition resulting from growth failure<sup>17</sup>. Stunting in children is also a risk factor for death, low motor development problems, low language skills, and functional imbalance.<sup>18</sup> Stunting is a problem of growth failure experienced by babies under five years old who experience malnutrition since in the womb until the baby is born, stunting itself will begin to appear when the baby is two years old. Stunting is a problem of malnutrition with a fairly long period so that there is a disturbance in the growth of height in children who are lower or shorter (dwarf) than the standard for their age.<sup>19</sup>

Stunting in toddlers is influenced by various factors such as maternal factors, paternal factors, infant and toddler factors, and environmental factors. In mothers who have a history of stunting, the risk of toddler stunting will increase when compared to mothers of toddlers who do not have a history of stunting. Mothers of toddlers who have a history of stunting will store information related to stunting in their genetics. Human growth itself is influenced by genetics. Genetics is one factor that cannot be changed because it is passed down directly from parents to children. For full-term babies, the size at birth reflects the influence of the uterine environment, at the age of 2 years the baby is correlated with the average height of the parents which indicates the influence of genetics. Other references also mention that after the age of 3 years the child's height is significantly correlated with the height of the parents<sup>20</sup>.

Genetics that carry the short trait are thought to affect hormonal work that plays a major role in growth, especially linear growth. Hormones greatly affect the body's condition through changes in growth. The presence of growth hormone affects the accumulation of cortical bone and may stimulate growth and height increase. Short parents tend to have short children because of the genetic factors they pass on to their children, so parents can only maximize environmental factors to support their children in achieving the maximum growth they can achieve.<sup>21</sup>

The characteristics of the mother or the condition of the mother including height are genetic factors that cause stunting in toddlers. Parents who have short height due to genes carrying short chromosomes are likely to pass on the short trait to their children. This is due to the pathological condition of growth hormone deficiency owned by the gene carrying the chromosome, if not supported by adequate intake to support growth, in the next generation it will have an impact on growth failure or stunted.<sup>22</sup> Height is a form of genetic expression, and is a factor that is passed down to children and is related to the incidence of stunting. Children with short parents, either one or both, are at greater risk of growing short than children with parents of normal height. If the short nature of the parents is caused by nutritional or pathological problems, then the short nature will not be passed down to their children

One or both parents who are short due to a pathological condition (such as growth hormone deficiency) have genes on their chromosomes that carry the trait for shortness, increasing the chance that their child will inherit the gene and grow up stunted. However, if the parents are short due to nutritional deficiencies or illness, the child may grow to normal height as long as the child is not exposed to other risk factors.<sup>23</sup> Mamabolo et al explains that parents who are short because of genes in chromosomes that carry the trait of shortness are likely to pass on the trait to their children. If the shortness of the parents is caused by nutritional or pathological problems, then the shortness of the trait will not be passed on to their children. This study did not examine the factors that influence the mother's height so it cannot be distinguished whether the mother's current height is a genetic influence or due to pathological or malnutritional influences.<sup>23</sup>

A mother who has a short height (<150 cm) is likely to give birth to a child with a short height as well. This will further increase the possibility of giving birth to a short child if the mother has a gene in the chromosome that carries the trait of being short. One effort that can be made to reduce the risk of a mother giving birth to a child with stunting is to improve the mother's nutritional intake. Improving the nutritional intake consumed must begin when the mother is a teenager. Adequate nutritional intake during pregnancy is also needed by mothers with short height. This is intended so that the fetus in the womb gets enough nutritional intake needed to grow and develop

optimally. Supervision is also important to be carried out since the toddler is born. Toddlers born to mothers with short height require strict supervision and monitoring to ensure that the toddler can grow and develop optimally.

## **2. Anthropometric status of stunted children after the consumption of mackerel nuggets.**

From the research results, it was found that most toddlers in this study had anthropometric status in the short category (stunted) (threshold (z score)  $-3$  SD to  $< -2$  SD) namely 25 respondents (83.3%), a small number of toddlers in this study had anthropometric status in the normal category (threshold (z score)  $-2$  SD to  $+3$  SD) as many as 5 respondents (16.7%), and none of the toddlers in this study had anthropometric status in the high category (threshold (z score)  $+3$  SD), and very short (severely stunted) (threshold (z score)  $< -3$  SD)

Stunting is a growth disorder that occurs in children under the age of two. Stunting has a negative impact on the development and growth of children if not addressed early. Children who do not receive exclusive breastfeeding and are given MP-ASI too soon are risk factors for stunting in children 24. Maternal nutritional factors before and during pregnancy are indirect causes that contribute to fetal growth and development. Pregnant women with malnutrition will cause the fetus to experience Intrauterine Growth Retardation (IGR), so that the baby will be born with malnutrition, and experience growth and development disorders. Children who experience growth retardation are caused by a lack of adequate food intake and repeated infectious diseases, and increased metabolic needs and reduced appetite, resulting in increased malnutrition in children. This situation makes it increasingly difficult to overcome growth disorders which ultimately have the potential for stunting 25

Stunting increase the risk of child mortality, negatively impacts cognitive and motor development, reduces school performance, increases the risk of over nutrition and non-communicable diseases, and reduces productivity in adulthood. However, stunting can be improved, one of which is by increasing nutritional intake in toddlers. Stunting that has occurred if not balanced with catch-up growth results in decreased growth, the problem of stunting is a public health problem related to increased risk of illness, death and obstacles to growth, both motoric and mental. Stunting is formed by growth faltering and inadequate catch-up growth which reflects the inability to achieve optimal growth, this reveals that groups of toddlers who are born with normal weight can experience stunting if the fulfillment of subsequent needs is not met properly

Stunting management is an effort that continues to be pursued and intensified by the Indonesian Government in its efforts to overcome the problem of stunting. Various efforts continue to be made through increasing access and quality of services, increasing cross-program/sector



cooperation, and increasing community empowerment. Strengthening the technical and management of all resources including planning, implementation of mobilization, and supervision of control is very important to achieve the expected goals. Integrated malnutrition management involves all stakeholders. Malnutrition and stunting toddler services require solid collaboration from the nutrition care team both in primary and secondary health facilities. Prevention and management of malnutrition must be carried out in a team approach consisting of doctors, nurses/midwives and nutritionists/dieticians (nutrition care team), and other health workers

In order to handle stunting cases, a doctor is responsible for conducting anamnesis and physical examination, as well as establishing a diagnosis based on clinical anthropometry and laboratory, determining the choice of action, laboratory examination and treatment, determining drug therapy and diet prescription in collaboration with nutritionists (nutritionists), conducting disease counseling, monitoring and evaluating the patient's medical development and nutritional status, and being responsible for medical care and for the patient as a whole. Then for nurses / midwives are responsible for conducting anthropometric measurements, carrying out nursing actions on the doctor's instructions, assisting in monitoring and evaluating feeding to stunting sufferers, being responsible for nursing care, including checking vital signs such as temperature, respiratory rate, and pulse rate of stunted toddlers. Nutritionists / dietitians are responsible for conducting nutritional assessments, making nutritional diagnoses, making nutritional interventions, for example making formulas and compiling food menus and providing nutritional counseling, monitoring and evaluating the interventions given including feeding to stunting patients, and being responsible for patient nutritional care. Then the Pharmacy Staff is responsible for providing drugs based on doctor's prescriptions, providing ReSoMal (Rehydration Solution for Malnutrition), consisting of oralit, granulated sugar and mineral mix, supervising drug and food interactions, and helping to monitor and evaluate the administration of drugs to patients. The last stakeholder is the growth and development team. The tasks of the growth and development team include conducting screening for developmental disorders, consulting with specialist doctors for patients being treated if needed, providing management according to the developmental disorders encountered, conducting periodic evaluations and analysis of patient conditions, and making records and reports

In an effort to ensure the effectiveness of the policy, efforts to accelerate stunting prevention need to target priority groups that include pregnant women, breastfeeding mothers, and children aged 0-23 months, or called households of the First 1,000 Days of Life. This group is the priority target of the National Strategy for Accelerating Stunting Prevention. The First 1,000 Days of Life is the most critical period in a child's growth and development. In Indonesia, the greatest

growth disorders occur during this period. As many as 48.9% of pregnant women suffer from anemia and some others experience Chronic Energy Deficiency (CED). This causes the prevalence of babies with Low Birth Weight (LBW), which is one of the main causes of stunting, to remain high, at around 6.2%. Inappropriate breastfeeding, food, and parenting patterns in the 0-23 month period interfere with children's growth and development. Riskesdas 2013 noted that decreased child growth and development is the result of poor eating patterns for babies and children. This causes an increase in the prevalence of stunting from 29% (0-6 months), to 39% (6-11 months), and to 42% (age 24-35 months). However, stunting is also influenced by maternal nutrition in the previous period, especially in the pre-conception period, namely women of childbearing age and adolescent girls

Efforts to manage stunting and wasting emphasize the importance of active participation of families and communities as well as related cross-sectors in efforts to overcome malnutrition in toddlers. This effort also recommends outpatient services for toddlers aged 6-59 months with malnutrition without complications. If there are complications, the toddler needs to be hospitalized until the complications are resolved and then allowed to undergo outpatient care until fully recovered. For infants under 6 months old with malnutrition, hospitalization is recommended, even if there are no complications. An integrated malnutrition management approach can be carried out by increasing the number of malnourished toddlers who are detected early, the scope of case handling, increasing the level of compliance, thereby reducing dropout of toddlers who undergo outpatient / inpatient care, and identifying the proportion of cases that are successfully cured. Integration and cooperation from various stakeholders will make stunting handling easier and faster to do

### **3. The effect of mackerel tuna consumption on changes in anthropometric status of stunted children**

From the results of data analysis on toddler height (pre-test), the average toddler height was 81.40 cm, with a minimum toddler height of 78 cm and a maximum toddler height of 86 cm. For toddler height (post-test), the average toddler height was 83.16 cm, with a minimum toddler height of 80 cm and a maximum toddler height of 88 cm. From the results of the analysis of changes in toddler anthropometric status, it was found that 5 toddlers experienced changes in anthropometric status, which were originally short (stunted) (threshold (z score)  $-3$  SD to  $< -2$  SD) changing to normal (threshold (z score)  $-2$  SD to  $+3$  SD). From the results of the Wilcoxon sign rank test, the Asymp Sig (2-tailed) value was obtained of  $0.000 < \text{significance } \alpha (0.05)$  so that the research hypothesis was accepted, which means that there is an effect of mackerel fish nugget consumption

on changes in the anthropometric status of stunted toddlers at the Rembang Health Center, Pasuruan Regency

The results of this study are similar to research conducted Septiana about the effect of fish nuggets on changes in the height of stunted toddlers aged 24-59 months in the Alas Health Center area.<sup>26</sup> From the results of the study, it was found that there was a significant difference between the control group and the treatment group (given an intervention of consuming fish nuggets) with a p value of 0.042 so that the results of the study concluded that providing fish nuggets as additional food for stunted toddlers will help stunted toddlers in meeting nutritional needs during growth and increase the height of stunted toddlers. The results of this study are also supported by research conducted by Saranani et al on stunting prevention through specific nutritional interventions of fish and egg nuggets in Torobulu Village, South Konawe Regency.<sup>27</sup> From the results of the intervention carried out for a period of 3 months, a significant increase in height and weight was obtained in stunted toddlers, so it can be concluded that the provision of mackerel nuggets has an effect on increasing the height and weight of stunted toddlers (p value: 0.031)

The management of stunting toddlers basically involves many policy makers and various focuses. One focus in handling stunting incidents in toddlers is to ensure that stunted toddlers have a good appetite. When the appetite of stunted toddlers has been formed, then food diversification is a continuation of the focus of the activities carried out. One type of food ingredient that can be applied to overcome the problem of stunting is using mackerel. The levels of omega 3 fatty acids in mackerel are quite high where the levels of omega fatty acids in mackerel are around 8.5 grams / 100 grams of meat. In addition, mackerel also has an Eicosapentaenoic Acid (EPA) content of around 0.93 grams / 100 grams of meat and Docosahexaenoic Acid (DHA) of around 5.7 grams / 100 grams of meat. In 100 grams of mackerel, there are various nutrients such as 21.3 grams of protein, 2.2 grams of carbohydrates, 136 milligrams of calcium, 3.4 grams of fat, 69 milligrams of phosphorus, 0.8 grams of iron, 214 milligrams of sodium, 245 milligrams of potassium, 0.20 grams of copper, 1.1 milligrams of zinc, 0.26 grams of thiamine (vitamin B1), 0.03 milligrams of riboflavin (vitamin B2), and 0.2 milligrams of niacin (vitamin B3). Mackerel also has a fairly high protein content. Based on the results of previous research, 100 grams of processed mackerel products contain 16.72% protein

Protein is one of the basic and important nutrients for the growth of toddlers and children. The amino acid content in protein supports the work of hormones and enzymes in the child's body to improve brain function and I think, strengthens the immune system, is useful in the formation of muscles, hair and also collagen. Essential amino acids in protein play a significant role in toddler

growth, including in achieving toddler height and weight according to their age. Essential amino acids will help toddlers overcome stunting problems experienced by toddlers. Protein also plays an important role in achieving toddler height according to age. Protein can trigger increased insulin levels such as growth factor I (IGF-I), a hormone that stimulates child growth. Protein is also a macronutrient that is important for the body, especially during growth and development

Nutritional problems in toddlers in Indonesia are still health problems that occur due to an imbalance between intake and body needs. Nutritional imbalance causes toddlers to experience many health problems and one of them is stunting. In children who experience stunting, some signs and symptoms that can be found include signs of late puberty, poor performance on attention and learning memory tests, late tooth growth, at the age of 8-10 years the child becomes quieter, does not make much eye contact, the child's growth slows down and the child's face looks younger than usual. The problem of stunting that occurs in toddlers must be addressed as early as possible because stunting has an impact on the stunted toddler itself. In the short term, stunting that occurs in toddlers has the potential to cause disorders of brain development, physical growth, intelligence, and metabolic disorders in the body, while in the long term it is easy to get sick, the emergence of diabetes, heart and blood vessel disease, obesity, cancer, stroke, disability in old age, and poor work quality so that productivity becomes low. The incidence of stunting is one of the problems that is considered serious when associated with the high morbidity and mortality rates, the incidence of obesity, poor cognitive development, and low levels of income productivity. These various problems are very easy to find in developing countries like Indonesia

Nutritional status in a toddler (aged 1-5 years) requires more nutrition because this period is considered the golden age. During this period a child will experience physical and mental development and will discover various new things, so that the fulfillment of nutrition during this period plays a very important role. Stunting that has occurred if not balanced with catch-up growth results in decreased growth, the problem of stunting is a public health problem related to increased risk of illness, death and obstacles to growth both motoric and mental. Stunting is formed by growth faltering and inadequate catch-up growth which reflects the inability to achieve optimal growth, this reveals that groups of toddlers who are born with normal weight can experience stunting if the fulfillment of subsequent needs is not met properly

Parenting patterns in providing food to toddlers are also very important during their growth because good child quality can be obtained from fulfilling the needs of growth and development aspects so that an optimal future is achieved. There are many nutritious foods that can be given to toddlers during this growth period. One of the foods that can be used to overcome stunting is by

consuming mackerel. However, in fact, there are rarely toddlers who want to consume mackerel directly. Although mackerel is processed in the form of grilled or fried fish, at the age of toddlers they are more interested in ready-to-eat food. Mackerel nuggets are a diversification of food ingredients where mackerel is used as the main ingredient in its manufacture. The high nutrition in mackerel will indirectly help toddlers in overcoming the stunting problems they experience

Mackerel processed into nuggets will make it easier for parents to serve quality food to their toddlers. In addition, mackerel processed in the form of nuggets is also more popular with toddlers compared to fried or grilled mackerel. When stunted toddlers like mackerel nuggets, then indirectly stunted toddlers will ensure that they are able to meet the nutritional needs of their bodies during growth and development. Parents of stunted toddlers who understand the importance of fulfilling nutrition and nutrition for their toddlers will certainly try to provide mackerel that can be consumed by their toddlers whenever their toddlers want. In order to ensure that every parent of a stunted toddler knows about the potential of mackerel to overcome the problem of stunting that occurs, health workers need to actively conduct socialization and education about it. In addition, the ease of obtaining mackerel is also a determining factor. Pasuruan Regency, which is famous for its marine fish products, has high potential in overcoming the problem of stunting using mackerel as a basic food ingredient.

## CONCLUSION

From the results of the research that has been conducted, several conclusions can be drawn as follows: Anthropometric status of stunted toddlers before being given intervention of consuming mackerel fish nuggets from the results of the study, it was found that all toddlers in this study had anthropometric status in the short category (stunted) (threshold (z score)  $-3\text{ SD}$  to  $<-2\text{ SD}$ ) namely 30 respondents (100%). Anthropometric status of stunted toddlers after being given intervention of consuming mackerel fish nuggets from the results of the study, it was found that most toddlers in this study had anthropometric status in the short category (stunted) (threshold (z score)  $-3\text{ SD}$  to  $<-2\text{ SD}$ ) namely 25 respondents (83.3%), and a small number of toddlers in this study had anthropometric status in the normal category (threshold (z score)  $-2\text{ SD}$  to  $+3\text{ SD}$ ) as many as 5 respondents (16.7%). There is an effect of consuming mackerel fish nuggets on changes in the anthropometric status of stunted toddlers with an Asymp Sig (2-tailed) value of  $0.000 < \text{significance } \alpha (0.05)$ .

---

**REFERENCES**

1. Kementerian PPN KP dan PNRI. Agenda 2030 untuk Pembangunan Berkelanjutan (the 2030 Agenda for Sustainable Development atau SDGs). 2019;1. Available from: <https://www.sdg2030indonesia.org/page/8-apa-itu>
2. Kementerian PPN KP dan PNRI. Kehidupan Sehat dan Sejahtera. Kementeri PPN/Bappenas [Internet]. 2022; Available from: <https://sdgs.bappenas.go.id/tujuan-3/>
3. Titaley CR, Ariawan I, Hapsari D, Muasyaroh A, Dibley MJ. Determinants of the stunting of children under two years old in Indonesia: A multilevel analysis of the 2013 Indonesia basic health survey. *Nutrients*. 2019;11(5).
4. WHO WHO. Stunting Prevalence Among Children Under 5 Years of Age (%) (model-based estimates). *Glob Heal Obs Data Repos* [Internet]. 2023;35. Available from: <https://www.who.int/data/gho/data/indicators/indicator-details/GHO/gho-jme-stunting-prevalence>
5. Kemenkes RI KKRI. Buku Saku Hasil Survey Status Gizi Indonesia (SSGI) Tahun 2022 [Internet]. Kementerian Kesehatan Republik Indonesia. 2022. 1–7 p. Available from: [https://repository.badankebijakan.kemkes.go.id/id/eprint/4855/3/Buku\\_Saku\\_SSGI\\_2022\\_rev\\_270123\\_OK.pdf](https://repository.badankebijakan.kemkes.go.id/id/eprint/4855/3/Buku_Saku_SSGI_2022_rev_270123_OK.pdf)
6. Pemkab Pasuruan PKP. Sistem Informasi Publikasi Data Stunting Kabupaten Pasuruan. 2023;8–11.
7. Sumartini E. Studi Literatur : Dampak Stunting Terhadap Kemampuan Kognitif Anak. *J Semin Nas*. 2020;Vol.2, No.:127–34.
8. Anwar S, Winarti E, Sunardi S. Systematic Review Faktor Risiko, Penyebab Dan Dampak Stunting Pada Anak. *J Ilmu Kesehat*. 2022;11(1):88.
9. Pratiwi R, Sari RS, Ratnasari F. Dampak status gizi pendek (stunting) terhadap prestasi belajar: A literature review. *J Ilm Ilmu Keperawatan* [Internet]. 2021;12(2):10–23. Available from: <https://stikes-nhm.e-journal.id/NU/article/view/317/284>
10. Yuwanti Y, Himawati L, Susanti MM. Pencegahan Stunting pada 1000 HPK. *J ABDIMAS-HIP Pengabd Kpd Masy*. 2022;3(1):35–9.
11. KSNRI KSNRI. Rakortek Stunting 2023 Hasilkan Rumusan Aksi Nyata untuk Kejar Angka Prevalensi Stunting 14% Pada 2024. 2024; Available from: <https://www.wapresri.go.id/rakortek-stunting-2023-hasilkan-rumusan-aksi-nyata-untuk-kejar-angka-prevalensi-stunting-14-pada-2024/>
12. Saranani S, Pongdatu M, Iqbah IP, Aini IN. Pencegahan Stunting Melalui Intervensi Gizi Spesifik

- Pemberian Nugget Ikan Kelor dan Telur di Desa Torobulu Kabupaten Konawe Selatan Prevention of Stunting Through Specific Nutrition Interventions Providing Moringa Fish Nuggets and Eggs in Torobulu Villag. 2023;
13. Legi NN, Rivolta G.M. Walalangi, Montol AB, Ranti IN. Tingkat Kesukaan Nugget Ikan Kembung (*Rastrelliger*) Dengan Penambahan Tepung Daun Kelor (*Moringa oleifera*) Pada Anak Sekolah Dasar Di SDN 2 Bolaang Kabupaten Bolaang Mongondow Nonce. 2023;149-.
  14. Indraswari S, Kurniasari R, Fikri AM. Karakteristik Organoleptik Dan Kandungan Gizi Bakso Ikan Kembung Dengan Substitusi Tepung Daun Kelor. *Ghidza J Gizi dan Kesehat*. 2022;6(1):94–104.
  15. Widiastity W, Harleli H. Hubungan Pemberian MP-ASI Terhadap Kejadian Stunting Pada Balita Usia 6 – 24 Bulan di Puskesmas Soropia. *Nurs Care Heal Technol J*. 2021;1(2):81–6.
  16. Kemenkes RI KKRI. Petunjuk Teknis Penyusunan dan Pelaksanaan Strategi Komunikasi Perubahan Perilaku Percepatan Pencegahan Stunting (Buku 1) [Internet]. Vol. 11, Kementerian Kesehatan Republik Indonesia. 2021. 1–116 p. Available from: [https://promkes.kemkes.go.id/download/fpkk/files49505Juknis\\_Implementasi\\_KPP\\_Stunting\\_ISBN\\_13072021.pdf](https://promkes.kemkes.go.id/download/fpkk/files49505Juknis_Implementasi_KPP_Stunting_ISBN_13072021.pdf)
  17. Kemendesa PDTT KDPDT dan T. Buku Saku Desa Dalam Penanganan Stunting. Kementerian Desa Pembangunan Daerah Tertinggal dan Transmigrasi. 2017. 42 p.
  18. Adelia FA, Widajanti L, Nugraheni SA. Hubungan Pengetahuan Gizi Ibu, Tingkat Konsumsi Gizi, Status Ketahanan Pangan Keluarga dengan Balita Stunting (Studi pada Balita Usia 24-59 Bulan di Wilayah Kerja Puskesmas Duren Kabupaten Semarang). *J Kesehat Masy*. 2018;6(5):361–9.
  19. Anggryni M, Mardiah W, Hermayanti Y, Rakhmawati W, Ramdhanie GG, Mediani HS. Faktor Pemberian Nutrisi Masa Golden Age dengan Kejadian Stunting pada Balita di Negara Berkembang. *J Obs J Pendidik Anak Usia Dini*. 2021;5(2):1764–76.
  20. Wardani Z, Sukandar D, Baliwati YF, Riyadi H. Sebuah Alternatif: Indeks Stunting Sebagai Evaluasi Kebijakan Intervensi Balita Stunting Di Indonesia. *J Indones Nutr Assoc* [Internet]. 2021;4(2). Available from: [https://persagi.org/ejournal/index.php/Gizi\\_Indon/article/view/535/265](https://persagi.org/ejournal/index.php/Gizi_Indon/article/view/535/265)
  21. Mentiana Y. Hubungan asupan energi dengan kejadian stunting pada balita usia 2-5 tahun kota Pekanbaru. *J Endur Kaji Ilm Probl Kesehat*. 2020;5(3):591–7.
  22. Susilawati S, Ginting SOB. Faktor-faktor resiko penyebab terjadinya stunting pada balita usia 23-59 bulan. *Indones J Public Heal*. 2023;1(1):70–8.

23. Rusliani N, Hidayani WR, Sulistyoningsih H. Literature Review: Faktor-Faktor yang Berhubungan dengan Kejadian Stunting pada Balita. *Bul Ilmu Kebidanan dan Keperawatan*. 2022;1(01):32–40.
24. Yusnidaryani A, Dosen P, Keperawatan A, Utara P, Kemenkes A. Biskuit Formulasi Daun Kelor (*Moringa Oleifera*) Dan Ikan Kembung (*Rastrelliger Brachysoma*) Terhadap Peningkatan Berat Badan Dan Tinggi Badan Bayi Dua Tahun Dengan Stunting. *Indones Trust Heal J*. 2023;6(2):88–94.
25. Supardi N, Asjur AV, Jusriani R. Penyuluhan Mengenai Pencegahan Stunting Dan Manfaat Ikan Kembung Untuk Peningkatan Sikap Ibu Dalam Memberikan Makanan Tinggi Protein Bagi Balita. *Borneo Community Heal Serv J*. 2023;3(3):1–7.
26. Pardamean B, Rahutomo R, Sudigyo D, Trinugroho JP, Nirwantono R, Hidayat AA, et al. Evaluation of Childhood Stunting Reduction Treatments in Indonesia. 2023;
27. Saranani S, Noviati N, Pongdatu M, Iqbah IP, Aini IN, Rohman A, et al. Pencegahan Stunting Melalui Intervensi Gizi Spesifik Pemberian Nugget Ikan Kelor dan Telur di Desa Torobulu Kabupaten Konawe Selatan. *J Mandala Pengabd Masy*. 2023;4(1):273–9.