

## EFFECT OF TUNA BONE FLOUR CRISPY BISCUITS CONSUMPTION ON HEIGHT GROWTH OF CHILDREN 12 - 48 MONTHS

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**Keywords:**

stunting, biscuits, flour, tuna fish bones

**ABSTRACT**

Short birth length in children indicates a lack of nutrients consumed by the mother during pregnancy, so that fetal growth is not optimal and results in short birth length. Research Objective: to determine the effect of consumption of crispy biscuits of tuna fish bone meal on height growth in children aged 12-48 months. Quasy experimental design with pre-test-post test design using paired t-test. The results of the proximate test of crispy biscuits of tuna fish bone meal moisture content 4.41%, ash content 11.19%, carbohydrate content 47.64%, protein content 6.40%, fat content 30.36%, calcium content 7038.70 mg/kg, phosphorus 0.91 mg/kg, potassium 2700.93 mg/kg, iron 60.73 mg/kg. The average height of children in the intervention group d crispy biscuits of tuna fish bone flour pre test 78.43 cm and post test 80.17 cm with a difference of 1.74 cm, control group pre test 88.84 cm and post test 89.84 cm with a difference of 1.01 cm. The results showed that there was a significant difference in the pre-test-post test of giving crispy biscuits of tuna fish bone meal on children's height ( $p = 0.03 < 0.05$ ). The conclusion is that giving crispy biscuits with tuna fish bone meal can increase height in children.

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### INTRODUCTION

Stunting is the failure of growth and development experienced by children due to poor nutrition, repeated infections, and inadequate psychosocial stimulation during the first 1000 days of life. (WHO, 2015). Growth failure during this period can be due to inadequate nutritional intake and suboptimal health conditions. (De Onis & Branca, 2016). Factors that cause stunting include colostrum and exclusive breastfeeding practices, children's consumption patterns, and infectious diseases suffered by children are direct causal factors that affect children's nutritional status and can have an impact on stunting. While the indirect causes are access and availability of foodstuffs as well as sanitation and environmental health. (Rosha et al., 2020).

Inadequate nutritional intake can lead to nutritional deficiencies, causing an imbalance between the intake and the nutritional needs required by the body. Nutritional intake is not only based on the amount but the variety of food provided can be an indicator of the quality of a foodstuff (Utami & Mubasyiroh, 2020).

One of the causes of stunting is maternal underconsumption of nutrients while the child is in the womb where fetal growth is taking place and infectious diseases in the mother during

pregnancy that can cause premature birth. These two conditions are the most significant factors contributing to the problem of stunting in children (Rahayu et al., 2018).

The importance of nutrition in the first five years ensures that children grow healthily, organs are formed with proper function, a strong immune system is built, and neurological and cognitive systems develop (UNICEF., 1999). Nutrition during the first five years will affect the growth and development of children in the future (Ministry of Health, 2016). The toddler age is a golden period so that the toddler age group needs attention, because it is a group that is prone to malnutrition so that attention needs to be given to the age group. ( of HealthMinistry , 2011).

One of the stunting prevention efforts in Indonesia focuses on fulfilling child nutrition in the first 1,000 days of life because it contributes to 30% of stunting reduction (Beluska-Turkan et al., 2019) : (Sari & Montessori, 2021). The factor of protein adequacy level is one of the determinants of the incidence of stunting (Lobo et al., 2019).

Supplementary feeding can help fulfil nutritional needs in the short term without reducing the consumption of daily foods containing a balanced range of nutrients. Tuna fish bone is a product that is often overlooked for its benefits. Tuna bones have nutritional content consisting of energy 105.0 cal, protein 24.1 g, ash 1.2 g, fat 0.1 g, ash 1.2 g, calcium 9.0 mg, phosphorus 220.0 mg, iron 1.1 mg, sodium 78.0 mg, retinol 5.0 mg, thiamin 0.1 mg, riboflavin 0.1 mg, and niacin 12.0 mg. fish bones have a proportion of 10% of the total body composition of fish which is one of the wastes that have high calcium content (Tangke et al., 2020).

Research on tuna fish bone meal with weight gain for children under five is still lacking, except those related to organoleptic tests as conducted respectively by (Tangke et al., 2020), on the effect of tuna bone meal fortification with different concentrations on calcium content and organoleptic quality of canned tuna fish porridge, as well as by (Misnati & Pomalingo, 2021) about the effect of the addition of tuna fishmeal on the acceptability and nutritional value of moringa biscuits. while by (Rozi & Ukhty, 2021) studied the characteristics of yellowfin tuna bone meal (*thunnus albacares*) as a source of calcium.

This study in 2022 has been initiated with the hedonic quality test organoleptic test (colour, aroma, taste, and texture) the results showed no significant difference between the overall assessment of the product on internal and external panelists, meaning that it was accepted. (Pascoal & Sahelangi, 2022).

The urgency of this research is that the adverse effects that can be caused by stunting are reducing the quality of Indonesia's human resources, productivity, and national competitiveness, so the solution is to conduct a study on the use of food ingredients that are often underutilised by the community while the raw materials are widely available, namely making tuna fish bones as flour and processed into biscuits for additional food in children under five. The advantage / uniqueness as a novelty of this research is the processing of tuna fish bones from no benefit to be converted into flour so that it becomes a food product that is easily accepted by the community. The chosen form of food product is biscuits with the consideration that this product is widely known and suitable for additional food in children under five years old and an economical price.

## METHODS

The research was conducted using a *quasy-experimental design* with a *pre-test-post test* design. The study was conducted in May - June 2023 in Mopusi Village, Bolaang Mongondow Regency. Determination of sample criteria registered and the last 3 months present in posyandu activities with the age of 24 - 48 months healthy and no disease abnormalities netted as many as 40 children. Sampling was done by random sampling based on the number of children netted from 40 children divided into two intervention and control groups of 15 children each and added 30% to keep the drop out sample. The number of samples for experimental research is 15 people per group (Riyanto & Hatmawan, 2020). How to collect data before and after the intervention, measure height with a stadiometer. In the tuna bone meal crispy biscuit group, each child was given 5 pieces of biscuits. Giving is done every morning. Product distribution is carried out by enumerators every morning every other day. This administration was carried out for one month. An independent *t-test* was conducted to compare changes in height of children under five before and after the intervention using the *paired t-test*. An alternative test is the *Mann-Whitney* test if the distribution variable is not normal. The desired level of significance in this study is 95%.

Proximate testing of tuna fish bone meal biscuits was carried out by the Manado Standardisation and Industrial Services Laboratory for proximate analysis. The proximate analysis included analysis of water, ash, protein, fat, carbohydrate, calcium, phosphorus, iron and potassium.

This research has been approved by the Research Ethics Commission of Politeknik Kesehatan Kemenkes Manado Number: No. KEPK.01/05/099/2022. Dated 4 July 2022. Approval was also obtained from the village head, the parents of the toddlers.

## RESULTS AND DISCUSSION

### Results.

#### Respondent Characteristics

The characteristics of the respondents consisted of an intervention group of 15 respondents and a control group of 15 respondents which can be described in table 1. shows that of the 15 respondents in the intervention and control groups, most were at the age of 36 - 48 months as many as 7 and 6 children or (47; 40%), and female gender as many as 8 people (53%) in the intervention group and 8 male control groups (53%).

Table 1. Characteristics of Respondents

NO	Respondent Characteristics	Intervention Group		Control Group	
		n	%	n	%
1	Age of Toddler				
	12 - 22 Months	5	33	4	27
	23 - 35 Months	3	20	5	33
	36 - 48 Months	7	47	6	40
	Total	15	100	15	100
2	Gender				
	Women	8	53	7	47

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Male	7	47	8	53
Total	15	100	15	100

**Proximate Test of Tuna Bone Flour Crispy Biscuits**

Proximate analysis carried out includes analysis of the levels of water, ash, protein, fat, Carbohydrate, Calcium, Phosphorus, Iron and Potassium whose test results are as in table 2 below;

Table 2: Proximate Testing Results of Tuna Bone Flour Crispy Biscuits

Test Parameters	Proximate Testing Results
Water (%)	4.41
Ash (%)	11.19
Carbohydrate (%)	47.64
Protein (%)	6.40
Fat (%)	30.36
Calcium (mg/kg)	7038.7
Potassium (mg/kg)	2700.9
Phosphorus (mg/kg)	0.91
Iron (mg/kg)	60.7

The results of the analysis showed that (table 2) proximate testing of tuna fish bone meal crispy biscuits moisture content of 4.41%; ash content of 11.19%; carbohydrate content of 47.64%, protein content of 6.40%; fat content of 30.36%; ; calcium content of 7038.70 mg / kg; and phosphorus content of 0.91 mg / kg; potassium content of 2700.93 mg / kg; iron content of 60.73 mg / kg.

**Data Normality Test**

The results of testing the normality of data using the Kolmogorov-Smirnov test with pre-test and post-test data in the tuna bone meal crispy biscuit intervention group and the control group with a significant level ( $\alpha$ ) 0.05 and obtained an Asymp. Sig (2-tailed) in the tuna fish bone flour crispy biscuit intervention group and control pre and post test results 0.095 and 0.064 > 0.05. so that in each group a decision was obtained to accept  $H_0$ , which means that the data comes from normally distributed data, then a *paired t-test* was conducted.

**Bivariate Test**

Based on table 4, the average height of children in the tuna fish bone flour crispy biscuit group pre intervention test 78.43 cm and post intervention test 80.17 cm with a difference of 1.74 cm While in the control group pre test 88.84 cm and post test as much as 89.84 cm with a difference of 1.01 cm. These results indicate an increase in the height of toddlers with the provision of crispy biscuits of tuna fish bone flour, the results of statistical tests with the simple t test test obtained a p value of 0.03 < 0.05 which indicates statistically there is a difference in height increase between after and before giving crispy biscuits of tuna fish bone flour.

Table 4 hypothesis results with *paired t-test*

Group	<i>paired t-test</i>			
	Mean	Difference	SD	$\rho$
Intervention				
pre test	78.43	1.74	1.88	0.03
test post	80.17			
Control				
pre test	88.84	1.01	0.20	0.00
test post	89.85			

## Discussion

### Proximate Test Results Tuna Bone Flour Crispy Biscuits

#### Water Content

Testing the moisture content of tuna bone meal crispy biscuits at 4.41% is lower than what was reported respectively by (Kaya et al., 2022) where oatmeal cookies with the addition of collagen from tuna fish bones (*Thunnus sp*) showed a relatively similar value of around 4.71% as reported by (Lahagu et al., 2023). The water content in tuna fish flour is 8.3% which is still higher. The results of other studies are still high when compared to (Lekahena et al., 2014) and (Putranto et al., 2015) that the moisture content of Tilapia and Belida fish bone meal produced was 3.0% - 4.0% respectively.

The difference in moisture content obtained is due to the method of making flour and bone drying techniques as well as the type of fish used (Putranto et al., 2015). This is further emphasised by (Hemung & Chin, 2013) that water molecules do not enter the connective tissue because it can be lost completely during drying in the oven and a low moisture content of 2% fish bone meal will be stable at room temperature and there is no microbial growth so that it can be used as an ingredient to make biscuits.

#### Ash Content

The ash content of tuna bone meal biscuits was 11.19%. This study is lower than the results of the respective studies from (Rahimatul, 2021) where the ash content of catfish bone meal was 51.58% and (Imran et al., 2019), the ash content of bone meal from milkfish with combined presto and alkaline extraction treatment was 13.55%. This is also reinforced by (Putranto et al., 2015) the ash content of belida fish bone meal treated with 3 hours of presto time was 88.52%. The results of ash content in this study were greater than the MP-ASI biscuits with milkfish flour substitution by (Husain, 2023), obtained ash content of 0.54%-1.09% and research by (Daeng, 2019). (Daeng, 2019) the ash content of skipjack bone biscuits was 2.83%. According to (Niraputri et al., 2021)(Niraputri et al., 2021), the size of the ash content is determined during the demineralisation process. The more calcium that dissolves in the demineralisation process, the lower the ash content will be.

### **Protein Content**

According to (Husain et al., 2020) fish protein content is related to the fat content in fish, fish that have a high fat content will have a low protein effect. This is in line with (Siregar et al., 2015) The longer the soaking time, the collagen formed will be dissolved in the acid solution, as a result the collagen that can be converted into gelatin is reduced and also the strength of the acid can damage the structure of the collagen protein, so that the protein content will decrease.

### **Fat Content**

Fat content in tuna bone meal crispy biscuits was 30.36%. This result is still high when compared to research conducted by (Rusky & Liviawaty, 2014) where the characteristic fat content of biscuits with the addition of jangilus fish bone meal (*Istiophorus Sp.*) was 13.3%, the same result from research by (Daeng, 2019). (Daeng, 2019) skipjack bone meal biscuits have a fat content of (22.00%). Research by (Syarafina et al., 2022) with the addition of 80 grams of catfish bone meal in snack bars the fat content was 22.9%. Different (Husain et al., 2023) with the addition of 20 grams of milkfish bone meal in making biscuits the fat content was 68.16%. According to (Hemung & Sample, 2013) fat content in bones correlates with body fat in each fish species and large (old) fish usually contain high fat. The fatty acid profile of fish bone meal from several species revealed that the content of unsaturated fatty acids was almost 80%. Typically, the unsaturated fatty acids are susceptible to oxidative degradation (oxidation

### **Carbohydrate Content**

Carbohydrates are one of the nutrients that produce energy in the body in the form of calories, carbohydrates are the result of photosynthesis, plants convert carbon dioxide into carbohydrates, carbohydrates in flour consist of carbohydrates in the form of simple sugars, pentose, dextrin, cellulose, and starch. (Sidoretno et al., 2022).

The carbohydrate content of tuna bone meal crispy biscuits of 47.64% was higher than that reported by (Ahmil et al., 2021) carbohydrate content in eel bone meal is 6.66%. The same thing is also from the results of research (Daeng, 2019) in the utilisation of skipjack fish bone meal (*Katsuwonus pelamis*) to increase the nutritional value of biscuits, the carbohydrate content is 0.48%. When compared to other studies it is lower as reported by (Alisa et al., 2023).. Carbohydrate content of rocking flower cake with the addition of 6% milkfish bone flour is 88.15%. Carbohydrate content in cookies with the addition of 30% mackerel bone meal was 51.14%. (Ambaryanti & Kandriasari, 2022).. Then (Astiana et al., 2023).. The addition of swanggi fish surimi flour with a concentration of 50% obtained a carbohydrate content of 66.99%.

According to (Syahril et al., 2016), the carbohydrate content in fish is very small compared to other nutrients. This is thought to be because the carbohydrate content in fish does not contain fibre but is in the form of glycogen and is influenced by the condition of the fish which can cause a decrease in glycogen levels, thus affecting the carbohydrate content of fishmeal.

The difference in carbohydrate content in fishmeal is influenced by the content of other nutrients, namely moisture content, ash content, fat content and protein content. The higher the nutrients (moisture content, ash content, fat content and protein content), the lower the carbohydrate content, and vice versa, the lower the nutrients (moisture content, ash content, fat content and protein content), the higher the carbohydrate content. (Husain et al., 2020).

### Mineral Content

The results of mineral proximate testing as in table 1 for chicken feet extract broth products and tuna fish bone meal crispy biscuits are respectively for calcium levels of 7038.70 mg/kg, potassium levels of 2700.93 mg/kg, iron 4 60.73 mg/kg and phosphorus 0.91mg/kg.

Calcium levels of 7,038.70 mg/kg or (0.7%) in tuna fish bone meal crispy biscuits are lower than the research from (Bechtel et al., 2019) where the calcium content (21.%) in catfish head meal, as well as in other species such as calcium snapper head meal: 2,51% (Munekata et al., 2020).. When compared with research from (Wardah & Sihmawati, 2022) . The average calcium content in sensory properties stick products with fortification of tuna extract fish bone meal and Kale leaves as natural food colouring is 0.04%. In contrast to (Pratiwi et al., 2018) (Pratiwi et al., 2018) showed that the results of calcium content analysis were still higher when compared to biscuits with skipjack offal flour substitution, which was 0.62%.

The high calcium content in fish bone meal is due to the presence of inorganic matrices between the collagen fibres in the bone that contain calcium crystals with the main minerals being calcium and phosphorus. (Syadeto et al., 2017). . This is emphasised by (Sundari et al., 2015) that food processing will generally decrease the chemical composition and nutrients of food ingredients caused by the type of food, the temperature used and the cooking process.

Potassium levels as shown in Table 1 for tuna bone meal crispy biscuits were 2700.93 mg/kg (0.27%). This result is still low when compared to the potassium content of papuyu fish bones of 3723.64 mg/kg (0.37%). (Widya et al., 2021). The results of this study were higher and the potassium content was lower as in the research from (Kusumaningrum et al., 2016) which showed belida fish bone calcium levels of 28.25-31.31%. Calcium levels in tilapia fish bones conducted by (Lekahena et al., 2014) ranged from 18.7-21.48%.

The phosphorus level in this study was higher than the research conducted by (Kusumaningrum et al., 2016) which showed the phosphorus content of belida fish bones ranged from 3.98-4.06%. The zinc content of papuyu fish bones obtained in this study was 19.70 mg/kg and papuyu fish scales 19.63 mg/kg. The iron content of tuna fish bone meal obtained in this study was 60.73 mg/kg, still higher than papuyu fish bones at 58.84 mg/kg and papuyu fish scales at 42.63 mg/kg. (Sukma et al., 2022).. Iron levels in this study were lower when compared to skipjack fish bones studied by (Harmain, R.M., Dali, F.A., Husain, 2018). 133.58mg/kg.

According to (Santoso et al., 2013) Changes in minerals in food due to the cooking process and interaction with other food ingredients so that it can change its chemical

structure while according to (Hafiludin, 2015) mineral content in fish is determined by the type of species, sex, and biological cycle of the analysed body parts.

### **Changes in Height Before and After Intervention**

The average height of children in the tuna bone meal crispy biscuits intervention group increased by 1.74 cm. While the group only increased by 1.01 cm. These results indicate an increase in the height of children under five with crispy biscuits of tuna bone meal in Mopusi Village in 2023, where the results of statistical tests with the simple t test  $p = 0.03 < 0.05$  which indicates there is an increase in the height of children under five with the provision of crispy biscuits of tuna bone meal.

Nutritional status has an important role in stunting, nutrition ensures that the development and growth of children's brain cells takes place normally and properly. adequate nutrition is one of the factors in achieving maximum growth and development, especially in the golden age period. (Sakti, 2020). Meanwhile, (Beal et al., 2018) explains that stunting is a condition of malnutrition, occurs for a long time and affects child growth and development and has an impact on late motor and mental development and inhibited cognitive abilities.

Tuna (Thunini) is a type of fish that is high in protein, with 22.6-26.2 gr/100gr of meat. (Septikasari, 2018). Omega-3 fatty acids are unsaturated essential fatty acids that are indispensable for humans in and are abundant in fish from the deep sea. (Domili & Fajar, 2021).

The nutritional content of tuna bone meal was found to be 11.34% moisture content, 59.49% ash content, 23.86% protein, 0.96% fat, 4.35% carbohydrate and 17.47% calcium (Talib et al, 2014). After being processed into crispy biscuits, the composition of the nutritional content was found to be 4.41% water content, 11.19% ash, 47.64% carbohydrate, protein, fat,

The results of this study indicate a change in the increase in height of toddlers 24-48 months with an average height after intervention with the provision of crispy biscuits of tuna fish bone meal increased by 1.7 cm. Product administration is given to different samples every day for one month the product is given 15 10 pieces of tuna fish cookies each, where the cookies in 1 piece contain nutritional values: 45.80 kcal energy, 0.60 g protein, 2.22 g fat, 5.96 g kh, 0.11 vit C, 15.06 SI vit A, 0.05 mg Zn, 0.14 g fibre.

The results of this study are the same as those produced by (Sumarlan et al., 2023) where before supplementary feeding the minimum height was 76.8cm and maximum 94.8cm. after supplementary feeding 2 times a day for 10 days there was an increase in minimum height of 77.0 cm and maximum 95.4. Based on statistical tests conducted. This result is also the same as research by (Abdillah et al., 2022) that there is an increase in height and changes in TB / U nutritional status before and after getting PMT in toddlers obtained a p-value of 0.000. This is in line with research conducted by (Sarni et al., 2022) that PMT in toddlers has a significant effect on changes in the nutritional status of toddlers in the Klasaman Health Centre working area of Sorong City, the addition of nutrients is needed by toddlers as the growth and development of these toddlers. This is in line with the results of a study conducted by (Adelasanti & Rakhma, 2018) at Puskesmas Pucangsawit Surakarta also shows that there is a relationship between compliance with consuming PMT in toddlers with changes in nutritional status. After the intervention of supplementary feeding, as many as 18.5% of toddlers experienced an increase in nutritional status. Research conducted (Hestuningtyas & Noer,



2014) showed that there was a positive effect of supplementary feeding with additional height and weight of toddlers and could reduce the incidence of undernutrition and stunting. This means that supplementary foods that contain balanced nutrients will be able to meet the nutritional needs of toddlers and improve nutritional status so as to reduce the risk of malnutrition in children. This is also reinforced by (Widiastuti & Winarso, 2021) ) showed a change in the nutritional status of measurements before the PMT programme and after the PMT programme there was an increase in the percentage of toddlers with normal TB. In contrast to research conducted by (Umasangaji et al., 2021) there is no significant relationship or no effectiveness of supplementary feeding on changes in height or length of body of children under five after supplementary feeding in toddlers in the Kapasa Puskesmas Working Area of Makassar City, the same thing is also in the research from (Juhartini, 2015)The same is also true in the research of (Juhartini, 2015), that the provision of PMT biscuits to undernourished toddlers, there is no effect of energy intake and protein intake on the addition of BW and TB after being given biscuits of moringa mixed food ingredients. The same thing has also been done by (Sutanti & Santo, 2021) (Sutanti & Santo, 2021) found that there was no effect of PMT combination of mung bean porridge and boiled eggs on changes in height of stunted toddlers.

According to the Ministry of Health Regulation, the standard monthly height gain for 6-10 year olds is 0.1 cm (Ministry of Health, 2020). Increases in height and weight are positively correlated with plasma IGF-1, and leptin levels, as well as changes in serum metabolites, which is in line with (Bartz et al., 2014). Based on research, increased serum levels of IGF-1, leptin, and branched-chain amino acids were significantly associated with weight-for-height gain as part of the recovery of malnourished children after 2 weeks of nutritional rehabilitation with ready-to-use therapeutic food ((Varkey et al., 2020) Factors that cause stunting include dietary intake. Research (Wellina et al., 2016) showed that the risk factors for stunting in children aged 12-24 months were low consumption of protein, zinc, as well as low birth weight and high exposure to pesticides. Furthermore, research (Fatimah & Wirjatmadi, 2018)(Fatimah & Wirjatmadi, 2018) wrote that to prevent stunting, the intake of nutrients at the age of growth needs to be considered.

Calcium intake is essential for the development and maintenance of bone mass during the newborn and adult years, increasing 40 times from newborn, and between 40% - 60% of the increase in bone mass occurs during the toddler to adolescent years (De Assumpção et al., 2016). (De Assumpção et al., 2016).. This is in line with the research on fortification of Tilapia fish bone meal (*Oreochromis niloticus*) in cookies aimed at increasing the quality content, especially calcium and phosphorus (Gusmawan et al., 2020). According to (Syadeto et al., 2017) food fortification with micronutrients is to increase the quality content, especially calcium and phosphorus. (Gusmawan et al., 2020).. According to (Syadeto et al., 2017) food fortification with micronutrients is one of the main strategies that can be used to improve food micronutrient status. Children with lower protein intake are four times more likely to be stunted than children with adequate intake. The higher risk is because protein intake participates in stimulating insulin on IGF-1 as serum tryptophan and IGF-1 levels are positively associated with linear growth (Fikawati et al., 2021).

This study has weaknesses and limitations including not making corrections to food consumption recall, the limited number of research samples, laboratory tests have not been carried out for product shelf life.

## **CONCLUSION**

Based on the results of the research that has been carried out, it can be concluded that:

Chemical characteristics of Tuna Fish Bone Flour Crispy Biscuits moisture content of 4.41%, ash content 11.19%, carbohydrate content 47.64%, protein content 6.40%; fat content 30.36%, crude fibre content 3.18%, calcium content 7038.70 mg/kg, and phosphorus content 0.91 mg/kg, potassium content 2700.93 mg/kg, iron content 60.73 mg/kg.

The average height of children in the Tuna Fish Bone Flour Crispy Biscuits Intervention group Pre Intervention Test 78.43 cm and Post Intervention Test 80.17 cm with a difference of 1.74 cm. While in the control group the pre test was 88.84 cm and the post test was 89.85 cm with a difference of 1.01cm.

The results of the intervention through the provision of Chicken Feet Extract Broth and Tuna Fish Bone Flour Crispy Biscuits showed an increase in height with the results of the simple t test statistical test obtained a p value of 0.03

## **Advice**

The use of chicken feet extract broth and tuna fish bone meal crispy biscuits can be used as an alternative food supplement for children under five. Further research is needed that is longer and larger samples to see the positive impact and conduct product durability tests.

## **Acknowledgements**

Thank you to Polytechnic Health Ministry of Health Manado for research funding for 2 years so that the research can run smoothly. The same to the leadership of Baristan Manado, the Head of Mopusi village and the Head of Tanoyan Health Centre, Bolaang Mongondow Regency as well as the Head and Lecturers of the Nutrition Department.

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Jurnal Health Sains

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