



# Effect of Supplementary Food Substitution of Sea Urchin Gonads (*Diadema Setosum*) on TSH Hormone, Height, and Weight of Stunted Toddlers in Soropia District

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**Abstract:** Stunting results in generational loss due to decreased ability to work productivity and IQ. Thyroid Stimulating Hormone (TSH) plays an important role in the growth process, in chronic growth hormone deficiency conditions will spur the incidence of stunting. The purpose of the study was to determine the effect of supplementary food formula substitution of sea urchin gonads (*Diadema Setosum*) on Thyroid hormone, height and weight of stunted toddlers in Soropia District. This experiment using RCT (Randomized Control Trial) design. The sample in this study were stunted toddlers in Soropia District. The formula uses a substitution of sea urchin gonads (*Diadema Setosum*) which is given in one portion of additional food. Additional food in the form of nuggets, sausages, bakwan. The formula is given for 3 months with a frequency of every day for 90 days. The Results to be achieved that the availability of supplementary food formulations substituting sea urchin gonads, nutritional content of supplementary food formulas, energy and protein consumption data, data on body height and thyroid hormone levels, body height and weight before and after supplementary food formulas.

**Keywords:** Energy Intake; Sea Urchin; Stunted Toddlers; Stunting; Supplementary Food; TSH Hormone

## Introduction

In Indonesia, the prevalence of stunting in children under five is still high (Anastasia et al., 2023; Permatasari et al., 2023). The 2018 Basic Health Research reported that the stunting rate in Indonesia is in the severe category >30% at 30.7%; effective strategies are needed to achieve the Ministry of Health's 2015-2019 RPJM target of 28%. 2015-2019 RPJM target of 28%. The President's development target until 2024 for stunting prevalence is 14%. Currently, the prevalence of stunting in Southeast Sulawesi is above the national rate 30.8%.

Stunting increases the risk of morbidity, mortality and economic losses due to the low quality of Indonesia's human resources in the future, and can be said to be a health emergency (Väyrynen, 2023; Zaheer et al., 2023). World Bank research illustrates economic losses due to stunting of 3-11% of gross domestic income

(GDP), poor public health and economic losses, which have an impact on the burden on the State related to non-communicable disease rates and a reduction in IQ by 5-11 points. That under-five stunting contributes to 1.5 million (15%) child deaths worldwide and causes 55 million lost years of healthy life each year (Prasetyo et al., 2023).

Stunting prevention carried out by the government through sensitive and specific program approaches is not optimal and is highly dependent on government funding, specific programs are more tangible than sensitive programs. The stunting countermeasure that has been running is in the form of supplementary feeding (SF) biscuits (Eaton, 2020). This program has the weakness that the availability of biscuits is highly dependent on supplies from government programs. On the other hand, the potential of protein sources such as sea urchin gonads has not been utilized to improve the

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quality of the menu of children under five (Kaharudin, 2020) and has not been developed as a substitute for local SF processed ingredients to overcome stunting. The potential of sea urchin gonads in Soropia can support the development of SF formulas using local food (Banudi et al., 2021) ingredients that will ensure program sustainability.

The potential of sea urchins in Southeast Sulawesi is quite high, related to the geography which is an archipelago, where 70% of the area is ocean. Communities living on the coast contribute health potential and health problems that are different and unique when compared to mainland communities. Sea urchin species that have been utilized by the community are *Tripneustes gratilla* (brown skin with white stripes), *M globules* (red skin), and *Echinometra SP* species (Hodin et al., 2019). Sea urchins are marine biota of the Echinodermata class, having different and unique life patterns (Parra-Luna et al., 2020). Sea urchin gonads are nutrient-rich foodstuffs (Murie & Bourdeau, 2021), containing complete essential amino acids, namely lysine, methionine, threonine, valine, arginine, histidine, tryptophan and phenylalanine and 5 non-essential amino acids such as serine, cysteine, aspartic acid, glutamic acid and glycine. Among them, there are two amino acids that are important for child growth, namely arginine and histidine (Haris et al., 2023).

Gonads Sea urchins also contain essential fatty acids such as lauric, myristic, palmitic and oleic (Pringgenies et al., 2020). Sea urchins contain minerals such as calcium and zinc which are important minerals for child growth (Mutalipassi et al., 2021).

Sea urchin gonads contain omega 3 unsaturated fatty acids which are needed for child health (Susanto et al., 2021). Sea urchins are rich in vitamin A, vitamin B complex and minerals that can facilitate the function of the nervous system and metabolism of the human body (Tee et al., 2021). The results of the nutritional value analysis of sea urchin gonads per 100 g dry weight are: 39.18 g protein, 8.7 g fat, 38.57 g carbohydrate, 8.2 g ash, 596 mg phosphorus, 776 mg calcium, 57.6 mg total carotene, 3.349 SI vitamin A, 0.08 mg vitamin B and 5.35 g water content.

The results of qualitative analysis of *Diadema setosum* gonads found five essential amino acids for adults namely lysine, methionine, phenylalanine, threonine, and valine, two essential amino acids for children namely arginine and histidine, also found aspartic acid, glutamic acid, glycine, serine (Kato & Schroeter, 1985). It was also reported that sea urchin gonads contain glycine, valine, alanine, methionine, and glutamic acid, and nucleotides of the IMP (Inosine Mono Phosphate) and GMP (Guanosine Mono Phosphate) types also influence the taste characterization of sea urchin gonads.

Lee & Haard (1982) reported that from the analysis of sea urchin gonad protein, it was found to contain about 28 kinds of amino acids. In addition, sea urchin gonads are also rich in vitamin B complex, vitamin A and minerals (Karnila et al., 2022; Padang et al., 2019; Phillips et al., 2009; Sabilu et al., 2022). There has been no research on the utilization of sea urchin gonads (*Diadema Setosum*) in stunting cases, thus encouraging researchers to develop SF substituted with sea urchin gonads on height gain and thyroid-stimulating hormone (TSH), also known as thyrotropin, is a glycoprotein secreted by the anterior part of the pituitary gland. The synthesis and secretion of TSH is regulated by the hypothalamus dominated by thyrotropin-releasing hormone (TRH) and peripheral factors dominated by thyroid hormone levels.

TSH secreted will bind to its receptor, which is called the thyroid-stimulating hormone receptor (TSHR). TSH hormone levels in children aged 12 to 59 months are 0.80-6.26 uIU/ml. The TSH-TSHR bond will have a clinical impact on the tissues and organs where the bond occurs. Thyroid gland and extrathyroidal tissue can be involved in the bonding. In the thyroid gland, TSHR causes thyrocytes to recognize and respond to TSH secreted by thyrotropic cells in the pituitary. This regulates thyrocyte proliferation, production and secretion of thyroid hormones. Disruption of signal transduction from TSH leads to thyroid disorders, such as goiter, hypothyroidism and hyperthyroidism, which have complex clinical manifestations (Hariani et al., 2018).

Functional TSHR expression has, until now, been of interest to further investigate the role that TSHR has on these extrathyroidal tissues. Tissues that have been known to express TSHR are adipose tissue, hypothalamus, anterior pituitary, bone, liver, and immune system. Thyroid-stimulating hormone (TSH) is a glycoprotein with a molecular mass of 28-30 kilo Daltons (kDa). It is a member of the glycoprotein hormone group in addition to follicle stimulating hormone (FSH), luteinizing hormone (LH), and human chorionic gonadotropine (hCG). Thyroid-stimulating hormone is synthesized and secreted by thyrotropic cells of the anterior pituitary gland. Thyrotropic cells make up about 5% of the anterior pituitary cells and are located in the anteromedial area of the gland. These cells are smaller than other cell types and are irregularly shaped with a thin nucleus and small secretory granules (120 - 150  $\mu$ m) (Hariani et al., 2018; Koro et al., 2018).

## Method

The scope of this research is a Quasi-experimental. This study used the intervention of supplementary

feeding from local food ingredients, namely sea urchin gonads (*Diadema Setosum*) with pretest-posttest design with control group with the following design Figure 1 (Purnama & Tasnim, 2022).

01	X 1	O 2
03	X 2	04

Figure 1. Design of research

Description:

O-1,2 = Observation number

X1 = Provision of additional food substituted with sea urchin gonad.

X2 = Supplementary feeding of government biscuit program

The population in the study was all children under five who were identified as stunted in Soropia District, totaling 72. The sample determination was determined by the total sampling method. Distribution of intervention and control samples by random (Hu et al., 2021). Samples in this study were toddlers identified as stunted with inclusion criteria, namely toddlers who are willing to be sampled during the study; age of toddlers 12-59 months; willing at the time of blood collection both Pre Test and Post test; and did not leave the location during the study. And will be divided into treatment groups and control groups. The treatment group will get SF each substitution of sea urchin gonads, while the control group gets the Biscuit program.

The materials and tools used in this study are materials for making SF Nugget: Standard supplementary food formulation is an effort to mix various food ingredients, the type and weight of which are determined and converted into processed food in the form of nuggets containing a nutritional composition of 200-400 calories and 7-12 grams of protein. The use per one-time administration is adjusted to the fulfillment of calories and protein in grams with a frequency of every day, as an additional food with the target of giving sample children research; formulation of additional food substitution of sea urchin gonads is made using standard recipes and substituted with sea urchin gonads (*Diadema Setosum*); sea urchin gonads are the genital parts of sea urchins or the commonly consumed parts of sea urchins; gonad substitution is the amount of gonads added to the SF in fresh form, the amount added will be determined according to the results of the 2021 study.; Height is a measure of body height known by measuring using a microtoice; and hormone TSH levels are all factors related to growth, namely related to the influence

of pregnancy, namely internal factors including genetics, gender, number of children, child order position and external factors including nutritional intake of the family environment. The growth factor in this study that was measured was the TSH hormone.

The data collected in this study were primary and secondary data (Johnston, 2014). Primary data included height and growth factors of stunted toddlers measured using the following methods: TSH serum levels are measured using Prodia laboratory. Nutritional intake measured by the FFQ method (amount, type and frequency) conducted by enumerators, anthropometry (TB/U, BB/U) measured by measuring body mass. Gender, number of children, children's position in the family, and family environment (parenting) were measured by asking using question forms.

The instruments used in this study were a height measuring instrument (microtoice), a weight meter (digital step scale), a consumption recal form, and for the measurement of TSH, Prodia Kendari laboratory and a form. Data quality control is conducted to ensure that the data collected is in accordance with the facts found in the field. The collected data will be processed following the following stages data entry. The data were then analyzed using independent t test.

## Result and Discussion

### Results

Sample Characteristics of Toddlers Based on Changes in TB/U Z-Score Before and after Intervention Frequency Distribution of Samples Based on Changes in Height by Age Children under five years old in Soropia Health Center Working Area, showed in this Tabel 1.

Based on Table 1 shows that the changes in height in the initial biscuit group were mostly normal nutritional status n = 15 (50%) and a small part of the nutritional status was very short at the beginning as much as n = 1 (3.33%), while in the initial nugget group most of the nutritional status was very short n = 10 (33.3%) and in the final group a small part was short n = 8 (26.7%) results.

The results of the paired t-test test which had significant changes were the average biscuit group (-0.5) while in the nugget (-2.02) located in the Soropia Health Center working area.

Sample Characteristics Based on Biscuit Group and Nugget Group Frequency Distribution of Samples Based on Weight Change by Age Children under five years old in Soropia Health Center Working Area, that is can be shown Table 2.

**Tabel 1.** Changes Hight the Experiment Class

Z-Scor TB / U	Biscuit Group				Nugget group			
	Begining		End		Begining		End	
	n	%	n	%	n	%	n	%
High	6.0	20.0	8.0	26.7	6.0	23.3	6.0	20.0
Normal	15.0	50.0	12.0	40.0	9.0	30.0	11.0	36.7
Low	8.0	26.7	9.0	30.0	5.0	16.7	5.0	16.7
Very Low	1.0	3.3	1.0	3.3	10.0	33.3	8.0	26.7

**Tabel 2.** Weight Change by Age Children under five years old in Soropia

Z-Scor BB/U	Biscuit Group				Nugget Group			
	Begining		End		Begining		End	
	n	%	n	%	n	%	n	%
More	8.0	26.6	7.0	23.3	8.0	26.7	5.0	16.7
Normal	9.0	30.0	11.0	36.7	7.0	23.3	10.0	33.3
Less	12.0	40.0	10.0	33.3	5.0	16.7	8.0	26.7
Very Less	1	3.3	2.0	6.7	10.0	33.3	7.0	23.3

Based on Table 2 shows that in the weight of the initial group of biscuits most of the samples were nutritionally deficient as many as n = 12 (40%), and a small portion of the final group of biscuits was very deficient as many as n = 2 (6.7%). While the initial group of nuggets was mostly very less as much as n = 10 (33.3%), and in the final group on nuggets a small portion of the nutritional status is more n = 5 (16.7%) in the Soropia Health Center working area. The t-test results showed that in the biscuit group (0.49) in the initial and final administration and in the Nugget group (0.20) both initial and final there were no significant changes before or after administration.

The results showed that there was a significant difference in toddler weight before and after SF in the nugget group with normal nutritional status. This shows that after giving SF nuggets for 90 days to toddlers with very poor nutrition can influence energy intake on toddler weight gain (Yunus, 2019) but in giving Biscuits for weight gain is not significant because at the beginning and end there is not much difference. The reason is that the child has started to get bored after giving it in month 3 and some are sick (influenza).

The onset of the economic crisis that hit Indonesia in 1997 has led to a decrease in production activities, as a result employment is reduced and per capita income decreases. Other factors that can affect nutritional status in toddlers are direct factors, namely, lack of food intake, and infectious diseases that may be suffered by the child and indirect influencing factors, namely: parental income, food availability in the household, diet, environmental sanitation, health services, parental work, knowledge (Oktarindasarira, 2020).

The impact of deficiencies on nutritional status and public health due to inadequate food consumption can

increase the prevalence of undernutrition and malnutrition. Food intake must be fulfilled which is a direct factor causing the incidence of stunting. Food intake can be used in the form of energy and other nutrients that function in supporting all body activities (Yusran et al., 2021). Lack of one of the nutrients, both energy and protein intake, makes the body experience nutrient deficiencies, so to overcome the deficit experienced, stored energy and protein are used by the body. Energy and protein stores will be depleted when this condition occurs for a long time, tissue damage will occur which can then cause stunting in children (Aini et al., 2018). Characteristics of Samples based on Energy Intake before and after Intervention in Toddlers in Soropia Health Center Working Area. Energy Intake of Samples in Biscuit Group and Buba Nugget Group (Diadema Cytosum).

Based on Table 3 shows that energy intake in the early nugget group most of the samples were normal energy intake as many as n = 17 (56.7%), and the late nugget group was small in overnutrition by n = 5 (53.3%) while the early biscuit group most of the samples were normal nutrition by n = 17 (56.7%) and in the final group a small portion of undernutrition as many as n = 6 (20%) in the Soropia Health Center working area.

In this study, the average energy intake of body weight before being given SF and after being given SF for 90 days there was no change in weight gain in the provision of supplementary food biscuits and nuggets. However, the provision of SF biscuits had no significant effect on nutritional status based on BB / U (p = 0.87). However, nugget SF had an effect on the nutritional status of children aged 37 to 59 months (p=0.027).

**Tabel 3.** Energy intake in the early nugget

Energy Intake	Nugget Group						Biscuit Group	
	Beginning		End		Beginning		End	
	n	%	n	%	n	%	n	%
More (> 120 %)	6.0	20.0	5.0	16.7	8.0	26.7	10.0	33.3
Normal (90- 19%)	17.0	56.7	16.0	53.3	17.0	56.6	14.0	46.7
Less (75- 90%)	7.0	23.3	9.0	30	5.0	16.7	6.0	20.0

Nugget and biscuit snacks are a source of carbohydrates which is one type of food that produces energy in the body that can be utilized for activities. Excess carbohydrate intake will be stored in the form of fat in the body as a backup energy source. Stored fat is needed in dissolving vitamins and as a source of energy that is easily absorbed by the intestines. Meanwhile, protein functions as a builder and maintainer of body cells and tissues (Aini et al., 2018).

The provision of additional food given to children in the form of biscuits in the control sample circulated by the Ministry of Health of the Republic of Indonesia

which contains 10 vitamins and 7 minerals, with a total energy nutritional value of 180 kcal, 6 grams of fat, 3 grams of protein. While the provision of Nugget additional food in the form of snacks is given as much as 80 gr / day which is given in the morning 40 gr and afternoon 40 gr, for 90 days.

Characteristics of Samples Based on TSH Examination before and After Intervention of Toddlers Frequency Distribution of Samples Based on TSH Examination of Toddlers in Soropia Health Center Working Area.

**Tabel 4.** TSH Examination of Toddlers in Soropia

TSH Check	Nugget Group						Biscuit Group	
	Beginning		End		Beginning		End	
	n	%	n	%	n	%	n	%
Normal ≥0,80- 6ulU/ml	35.0	100.0	34.0	97.1	34.0	97.1	32.0	91.4
Less<0,80- 6ulU/ml	0.0	0.0	1.0	2.9	1.0	2.9	3.0	8.6

Based on Table 4 shows that TSH examination in the initial Nugget Group most of the samples were normal as many as n = 35 (100%), and the final group of nuggets was small n = 1 (2.9%). And the initial biscuit group was mostly normal n = 34 (97.1%) and the final group was less n = 3 (8.6%) in the Soropia Health Center working area.

*Discussion*

Based on the results of the 2016 nutritional status assessment, the national nutritional status of toddlers with TB/U or PB/U in the stunting category reached 27.5% in Southeast Sulawesi Province, the prevalence of stunting among toddlers reached 29.5%. In 2016 the results of the nutritional status assessment in Southeast Sulawesi Province, the prevalence for Konawe District reached 25.5% above the national prevalence. while according to the results of the Indonesian Nutrition Status Survey (SSGI) in 2021 in Southeast Sulawesi province, the prevalence of stunting was 30.2%. However, the current condition still requires acceleration, especially considering the mandate of Presidential Regulation Number 72 of 2021 so that stunting can fall to 14% by 2024.

This study, which is a continuation of research in 2021, on the administration of 3 grams / day of gonad flour can increase the sample body weight equal to the

positive control (0.4 grams) high compared to F2 (0.3 grams) and F1 equal to the negative control (0.1 gr) in the Rattus norwegicus experimental model. The results of statistical analysis showed no difference in body length (p = 0.90) and body weight (p = 0.93) after administration of gonad flour.

Sea urchin gonads have a fairly high nutritional content, which has amino acids needed by the body, for growth, some research results that prove that sea urchin gonads D. Setosum, E. Calamaris and E. Diadema contain total fatty acids of 60.37%, 58.35% and 58.55%, respectively. The highest fatty acid content was palmitic acid at 18.44% in D. Setosum gonads, 16.65% in E. Diadema gonads and 16.55% in E. Calamaris gonads. The three types of sea urchin gonads contained omega-3 unsaturated fatty acids (3.16-3.99) %, omega-6 (9.21-13.88) %, omega-9 (3.95-5.01) %, EPA (2.3-2.89) % and DHA (0.38-0.73) %. Amino acids contained in sea urchin gonads are 15 types consisting of 8 types of essential amino acids and 7 types of non-essential amino acids. The total amino acid content in D. setosum, E. calamaris and E. diadema is 13.41%, 10.49% and 10.72%.16

In the results of this study, the number of samples was 60, with the age of 12 - 59 months, which was carried out in Soropia sub-district, Konawe district, with various efforts have been made to overcome this stunting problem.

There are two types of Supplementary Feeding (SF), namely Supplementary Feeding (SF) Recovery and Supplementary Feeding (SF) Counseling (Ahmad et al., 2020). In the study, the form of recovery SF was in the form of nugget snacks and government program biscuits. Both have the same goal, which is to meet the nutritional needs of children under five as well as routine monitoring of growth through posyandu activities, and weighing every month during the study, but the national nutrition problem, stunting still needs special attention.

SF recovery is given for 3 months and the frequency is every day for 90 consecutive days or SF recovery is intended to meet the nutritional needs of toddlers as well as learning for mothers of targeted toddlers. SF Recovery is provided in the form of food or local food ingredients such as snack nuggets, and as an addition to daily food not as a substitute for the main food. Recovery supplementary food is preferably based on local food ingredients. SF Counseling is additional food given to children under five years old provided by researchers and assisted by posyandu cadres.

The purpose of SF Counseling is as a target for counseling parents of toddlers about good snacks given to toddlers (Dunn et al., 2012), as a means to help meet the nutritional needs of toddlers. While SF Recovery manufacturers are given in the form of biscuits from the government in this case partnering with Puskesmas Soropia to distribute to malnourished toddlers. Complementary foods in the form of biscuits containing 10 vitamins and 7 minerals. Biscuits are only for children aged 12-24 months, with nutritional values: 180 kcal total energy, 6 grams of fat, 3 grams of protein. The number of servings contains 29 grams of total carbohydrates, 2 grams of dietary fiber, 8 grams of sugar and 120 mg of sodium. The nutritional status of children under five will affect the socio-economic conditions of the family (parents), where parents' education, parents' work, the number of children and the overall economic conditions of the parents (Supriasa, 2012).

#### *Mother's age*

In this study most of them were 26-35 years old  $n = 32$  (46.7%), the age of respondents can be said to be very productive, because this age is still young and needs to be informed about the need for parenting in children under five. Mother's Age Based on the results of the study, it shows that a small proportion of mothers with risky age categories, namely there are 5 mothers (8.3%) mothers with risky ages <20 years and >35 years. in line with research by Yunus (2019) The results of bivariate analysis showed no relationship between maternal age and nutritional status assessment of toddlers. Mothers with risky ages <20 years and >35 years have a higher

percentage of undernutrition (73.3%) compared to good nutritional status.

#### *Mother's Occupation*

Respondents in this study mostly did not work at  $n = 52$  (86.7%), this is because local conditions do not prioritize working mothers, and this can be seen in reality, because coastal communities do not want to work outside the area. The results of bivariate analysis showed no relationship between work and nutritional status assessment, and it can be concluded that non-working mothers have a 0.358 times chance of having toddlers with good nutrition compared to mothers who do not work. In contrast to the statement of Bain et al. (2013) which states that mothers who do not work will affect children under five experiencing malnutrition.

#### *Education*

Respondents in this study were mostly educated mostly graduated from junior high school  $n = 26$  (43.3%) Low levels of parental education can have an effect on increasing the risk of malnutrition (Geda, 2021) and can affect parenting patterns towards knowledge about nutrition and will increase the risk of stunting if not in accordance with their parenting patterns.

#### *Age of Toddlers*

In this study, the age of 12-59 months was the subject of research who were malnourished in the Soropia Health Center area. Children who are malnourished at toddler age will grow short, and experience impaired brain growth and development which affects the low level of intelligence (Handryastuti et al., 2022), because brain growth and development is 80%. For 3-5 years old at this age the child can already ask for something, including asking for the food he wants such as asking to eat, drink, milk or other foods that they like. A nutritious and healthy diet in children under five, on the other hand, gets the main attention from their parents, so that children do not experience energy and protein deficits.

#### *Gender*

Gender Samples there is no difference for the z-score of children under five to weight. According to the results of research by Kusuma & Nuryanto (2013) the results of the t-test showed no difference based on the intervention and control groups between boys and girls.

The results of TB/U research in this study, the mean z-score value of height compared to age was -1.82 SD with a minimum value of -5.37 SD and a maximum value of 1.16 SD. This value does not affect the increase in height. According to WHO in 2005.

### *Body Weight*

The results showed that most of the weight of children under five years old increased (increased) which amounted to 0.4 (-1.8-3.6), for weight gain in one month around 200g it can be said to increase. Malnutrition status according to BB/U for the intervention was 73.3 to 26.7 while the control n= 23 (38.3%). For short nutritional status according to TB/U measurement, n=18 (30%) interventions and n=15 (25%) controls. According to the WHO Child Growth Standard is based on the index of body length compared to age (PB/U) or height compared to age (TB/U). According to the Ministry of Health of the Republic of Indonesia in 2017 the Weight-for-Age Index (BB/U) was 9.5% of children under five in the underweight category and decreased compared to the previous year. While toddlers who are overweight (obese) reached 4.6%, also lower than the previous year. with limits (So it is done so that it can be known the cause of malnutrition or the cause of Wasted (short z-score) less than SD is referred to as stunting.

### *Height*

According to WHO, the prevalence of short toddlers becomes a public health problem if the prevalence is 20% or more. The percentage of short toddlers in Indonesia is still high and this is a health problem that must be addressed.

Ages 12 to 59 months based on nutritional status monitoring 5 conducted by the Ministry of Health of the Republic of Indonesia in 2017 who experienced nutritional problems reached 17.8 the same as the previous year. This number consists of toddlers who are malnourished at 3.8% and undernourished at 14%. According to nutritional status based on the Height-for-age Index (TB/U). Toddlers in Indonesia who were stunted or stunted last year reached 29.6%. This figure is higher than the previous year. With details of 9.8% of infants aged 0-59 months in the very short category and 19.8% in the short category.

### *TSH Measurement*

At the beginning of the study TSH measurements amounted to 60 samples, but after the Post Test who were willing to measure TSH as many as 36 were taken, but there was one unsuccessful sample because the toddler was raging (struggling) not to take blood samples. so the total number of samples until the end of the study was 35 who were successfully examined for TSH level measurements. This shows that the results of the Thyroid Stimulating Hormone (TSH) examination in the T1 to T2 research samples were mostly in the good (normal) category n = 34 (97.1%) in the good category control amounted to n = 32 (91.4%). in the Soropia Health Center working area.

In this study there were 3 samples of children under five, who experienced treatment such as influenza and fever. TSH examination Increased T3 levels can occur in hypothyroid patients who are receiving treatment (therapy). The minimum concentration that can be detected is 0.2 ng/m. The range of values for T3 is 1.3 - 3.1 nmol/L or 0.8-2.0 ng/mL. The lowest limit of detection is 0.300 nmol/L or 0.195ng/mL.15 while the range in normal individuals is 0.6-1.85 ng/mL.

## **Conclusion**

The age of toddlers is mostly 12-36 months old. In the provision of snack food (SF) nuggets and Biscuits, before and after giving most of them there is an increase in body weight. The energy intake of children increased after giving Nugget SF. Although weight gain was insignificant in biscuit feeding. In the provision of SF biscuits BB/U (p=0.87). However, nugget SF had an effect on undernutrition status at the age of 37 - 59 months (p=0.027). Z-Score The mean height-for-age score was -1.82 SD with a minimum score of -5.37 SD and a maximum score of 1.16 SD. Z-Score Value The mean value of body weight by age was -1.8-3.6SD. The results of t-tests showed that in the biscuit group (0.49) at the beginning and end of administration and Nugget (0.201) both at the beginning and end there were no significant changes before or after administration. In the TSH examination there was no effect either before or after giving SF. And then the suggestion is it is need more effective parental care for children under five, diligently bring to the health service to know the weight of children every day. Health services in order to know the child's weight every month, by weighing the child. Posyandu, can monitor child growth and development.

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### **Conflicts of Interest**

The authors declare no conflict of interest.

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