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**The Relationship between Protein, Zinc and Phosphorus  
Consumption to IGF-1 Status of Children Aged 6-24  
Months in Timur Tengah Selatan Regency, Nusa  
Tenggara Timur Province**

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**Abstract**

Status of malnutrition in children should watch out because it can lead to immunological suppression, impaired growth, increased morbidity from infectious diseases, developmental disorders and the presence of locomotor coordination in infants and children, inhibition of learning progress and speaking, a deficit of intelligence quotient (IQ) permanently 5 points below normal, as well as developmental disorders and cognitive behavior. This study aimed to examines the relationship between protein intake, Zink and Phosphorus with IGF-1 status in Timur Tengah, Selatan Regency, Nusa Tenggara Timur Province. This study was an observational study with cross-sectional design. The experiment was conducted in nine sub-district of South Central Timur. Children's levels of IGF-1 are determined using Elisa Quantikine Human IGF-1 Immunoassay. Other data that food consumption in children 6-24 months of age is obtained through consumption recall, while other supporting data obtained through questionnaires by enumerators power. Analysis of nutrients content in foods used a food processor 2 (FP2). The statistical test used was t-test. The results showed that the father work mostly farmers while the mother does not work. Mother's education and father respectively 51 people (70.8%) and 48 (66.7%) 9 years of basic education.

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IGF-1 levels below the average in children aged 6-24 months by 59 (81.9%). Statistical test between nutrient consumption of protein, Zinc and Phosphorus with a confidence level of 95% indicates that there is a significant correlation between protein intake Zinc and Phosphorus with IGF-1 status.

**Keywords:** IGF-1; Children aged 6-24 months; nutrient consumption.

## **1. Introduction**

Nowadays, most of Indonesian people are still suffering from malnutrition, especially mothers, infants and children concurrently. Nutritional problems are more likely to increase and result in a

double burden that is hindering the rate of development (Bappenas, 2011). In general, the major nutritional problem in Indonesia is dominated by less energy protein (PEM), due to iodine deficiency disorders (IDD), vitamin A deficiency (VAD) and iron deficiency anemia (AGB). Problem of lack energy and protein in infants and children should be addressed. According to the

World Health Organization (WHO) 54% of the causes of infant and child mortality is influenced by nutritional factors. In Indonesia, a child would be at risk of dying if he was suffering from severe malnutrition. Each year 150,000 children die before reaching the age of 5 years, especially among the poor (UNICEF, 2012). Furthermore malnutrition in children should watch out because it can lead to immunological suppression [1], increased morbidity from infectious diseases, the presence of developmental disorders and locomotor coordination in infants and children, inhibition of progress learning and language [2], the deficit of intelligence quotient (IQ) permanently 5 points below normal, as well as developmental disorders and cognitive behavioral [3].

According to the results of fundamental medical research in 2010 by Weight / Age showed that the highest prevalence of malnutrition in Gorontalo as much as 11.2%, followed by NTB as much as 10.6%, West Kalimantan (9.5%) and 9.1% in West Papua whereas the highest prevalence of malnutrition in Central Kalimantan reached 22.3%, then 20.4% in NTT and NTB as much as 19.9% [4]. While in 2013, the proportion of underweight children get less in NTT, as much as 34.6%, 48.2% stunting and underweight 15%. The high prevalence of malnutrition and stunting children and low levels of consumption, required further research and analysis to assess the correlation between the consumption of protein, zinc and phosphorus with IGF-1. Based on this background, this study aims to examine the relationship of protein consumption, Zinc and Phosphorus with IGF-1 levels for children existed in Tengah Selatan Regency, Nusa Tenggara Timur province.

## **2. Material and Methods**

This research was an observational study. Survey was conducted with cross sectional method. The study was carried out in Tengah Selatan Timur Regency, Nusa Tenggara Timur Province, covered in nine sub-districts, i.e; Kuantana, Batu Putih, South Molo, Soe, Amanuban West, Kuanfatu, East Amanuban, Polen and Kualin. Levels of Insuline-Like Growth Factor-1 in children was determined using the method of Elisa Quantikine Human IGF-1 Immunoassay. Child's blood was taken and analyzed by energy analysts of Hospital Infection and Tropical

Diseases (RSPIT) Surabaya. Other data that children's food consumption is obtained through consumption recall, while other supporting data such as the education level of mothers and fathers, mothers and fathers occupation and others obtained through questionnaires were collected with the help of enumerators. Enumerators derived from public health graduates who have received training before. Data levels of IGF-1 child as ratio ( $\mu\text{g/mL}$ ). Analysis of food nutrients in a food processor 2 (FP2). Finally, those correlation was analyzed statistically with t test.

### 3. Result and Discussion

#### 3.1 Characteristics of Respondents

The number of respondents were 72 children, mostly boys as many as 37 children (51.4%), for children aged 6-11 months as many as 25 children (34.7%). Number of family members that less than 4 people as many as 34 children (47.2%). The number of family members will affect the distribution of food in the family. The greater the number of family members the greater risk of a less even distribution of the food. The parents occupation affects income and ability to provide food to the respondent. Educational mother and father were 51 people (70.8%) and 48 persons (66.7%) 9 years of basic education, respectively. The influence of mother's education is very large, because mother becomes a determinant and regulator of food intake that is to the amount of food intake in children. At this age, children are vulnerable to situation of nutritional deficiencies, especially with low-educated mothers. The results of measurements of IGF-1 levels below the average for children in Timur Tengah Selatan by 59 (81.9%). Status under normal IGF-1 strongly inhibit the growth of children.

**Table 1:** Characteristics of Research Subjects

Variable	n %
Sex (male) %	37 (51,4)
age (6-11 mounths) %	25 (34,7)
Number of Family Members (< 4) %	34 (47,2)
Father's Job (Farmer) %	35 (48,6)
Mother's Job (unemployed) %	57(79,2)
Mother's education ( 9 years of compulsory education) %	51 (70,8)

In table 2 presents the results of the levels of IGF-1 measurements on children aged 6-24 months in Timur Tengah Selatan regency, where found that IGF-1 levels below the average of 59 (81.9%).

The relationship of protein consumption, Zink and phosphorus with IGF-1 status in children aged 6-24 months.

Levels Insuline-Like Growth Factor-1 (IGF-1) in children aged 6-24 months are determined by the level of consumption of protein, zinc and phosphorus. Protein as a base material formation of Insuline-Like Growth Factor-1 (IGF-1), while Zink and phosphorus gives a great influence on the synthesis of IGF-I DNA during stimulation phase in the cell cycle.

**Table 2:** Status of IGF-1 children aged 6-11 months in Timur Tengah Selatan regency.

IGF-1 Status	n(%)
Below the average	59 (81,9)
Above the average	13 (18,1)
Sum	72 (100)

**Table 3:** The relationship of protein consumption, Zink and phosphorus with IGF-1 status in children aged 6-24 months in Timur Tengah Selatan Regency, Nusa Tenggara Timur Province.

Nutrients Average	+ SD		P
	Below the average	Above the average	
Protein	8.96 + 6,98	16,63 + 14,98	0,005
Zinc	1,27 + 1,04	2,01 + 1,72	0,037
Phosphor	151,22 + 155,45	294,81 + 294,48	0,011

Based on the results of statistical tests on nutrients derived from the protein showed that there was a significant correlation ( $P < 0.05$ ) between the consumption of proteins with IGF-1 status of children. This study agrees with the results of research Donahue and Phillips (1989) that patients with protein deficiency or malnutrition status has IGF-1 levels were low ( $39 \pm 7 \mu\text{g/L}$ ) compared to just less energy alone ( $109 \pm 25 \text{ ITG / L}$ ,  $p < 0.005$ ). A strong relationship between IGF-1 and nutritional status with protein consumption. high-protein diet of 35% of the total energy the lower body fat content will not prevent the mechanical properties [5]. On food with high protein can reduce insulin requirements respondent, insulin resistance is accompanied by increased levels of IGF-1, which is produced from the synthesis of IGF-1 levels are a lot of protein IGF-1 binding, leading to increased levels of IGF-1 plasma [6].

Studies on tested animals showed that the intake of the protein deficiency can cause postreceptor which is responsible for reduction in mRNA transcription-IGF-1. it may cause a decline in roduction IGF-1 (Underwood et al. 1994) and increased affinity for the IGF-1 binding the protein-3 predecessor IGFB disturbed in conditions of lack of protein and disappeared from the serum. Protein plays a role in modulating circulating concentrations of IGF-1 are associated with the lack of protein intake. [6] state that a high protein intake may promote increased levels of IGF-1, whereas a low protein intake reduces the activity of IGF-1. Statistical tests for nutritional value of zinc obtained  $P < 0.05$  indicates that there is a significant relationship between the consumption of zinc with IGF-1 status. This research is in accordance with previous studies that zinc is also involved in the regulation of IGF-1 bioactivity that affects circulation of IGF-1 concentrations in humans. Low zinc status associated with low-circulating IGF-1 although sufficient caloric intake. So, zinc gives a great influence on the synthesis of IGF-I DNA during the stimulation phase of the cell cycle. Total zinc concentration of 3T3 cells treated with DTPA for 16 hours did not differ from the cells untreated, then only a small compartment cells affected by DTPA [7,8].

Statistical test for phosphorus nutrition value obtained  $P < 0.05$ , which indicates that there is a significant relationship between intake of phosphorus with IGF-1 status. [9] stated that the intake of phosphorus is the factor most strongly associated with high levels of IGF-1 ( $p < 0.0001$ ). Studies conducted by [9, 10] also showed that serum IGF-1 levels correlated positively with phosphorus significantly.

#### **4. Conclusion**

Based on the results of the study concluded that the nutrient consumption of protein, zinc and phosphorus affected the status of IGF-1 in children in Timur Tengah Selatan Regency, Nusa Tenggara Timur Province.

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