

# The Relationship of Iodine Deficiency Disorder (IDD) and Stunting with Cognitive Development in Elementary School Children in Enrekang Regency

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## Abstract

The Objective of the research is to see the relationship between Iodine Deficiency Disorder (IDD) and Stunting with Cognitive Development in Elementary School Children in Enrekang Regency. This research used a cross sectional approach, with 100 respondents aged 6-12 years. The data were collected by using questionnaires and measurements of weight and height to obtain stunting results based on the child's Z-score. Palpation and Urine Iodine Excretion (EIU) to obtain IDD results and the Montreal Cognitive Assessment (Moca-Ina) measuring cognitive. Data were analyzed by using Pearson correlation analysis. The results of the research is from the total respondents with IDD (EIU status) there were respondents with mild deficiency (18%), respondents with moderate deficiency (2%) and respondents with severe deficiency (1%). The rest (51%) of respondents are iodine sufficient and (28%) of respondents are at risk of hyperthyroidism. Respondents with stunting nutritional status is 72%, consisting of highly stunting (19%) and stunting (53%). Respondents with low cognitive scores were 89%. The results of the bivariate analysis showed that there is no relationship between IDD and cognitive development (P value = 0.835). There is a relationship between stunting and cognitive development (p value = 0.011). Malnutrition or stunting in the long term can inhibit cognitive development.

**Keywords:** IDD, Stunting, Children, Development, Cognitive

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## Introduction

Currently, Indonesia is experiencing multiple nutritional problems, namely malnutrition (stunting and IDD) and overnutrition (obesity). Stunting is a form of nutritional disorder in terms of body size which is characterized by short body size with a Z-score H/A under -2 SD (WHO, 2010). Indicator for assessing stunting is based on H/A with a threshold (z-score) of -2 SD. Iodine Deficiency Disorders (IDD) are disorders which include enlargement of the thyroid gland, cretinism, IQ deficiency 10-15 points, mental retardation, hypothyroidism, which is experienced by a person when there is a lack of iodine in his body. IDD can be experienced by all age groups from fetuses to adults who are classified as vulnerable groups (Delima, 2014).

Iodine deficiency can cause an IQ loss of 10 to 15 points at the population level worldwide (Izati&Mahmudiono, 2017). The brain is a nerve center that is very influential on the child's response to see, hear, think, and make movements. Lack of nutrition for a long time will cause permanent brain function disorders (Sumartini, 2020).

Based on the 2018 Basic Health Research, the prevalence of stunting in South Sulawesi in children aged 5-12 years old is 26.05%, consisting of 5.84% very short and 20.21% short. South Sulawesi Province is in the 4th place around 37% nationally. Enrekang Regency is included in 1 of 10 regencies in South Sulawesi that contribute to the high stunting rate in South Sulawesi and is in the 4th position, first by Pangkep Regency, then Tanah Toraja, and Bone. Percentage of stunting incidence in children aged 5-12 years in Enrekang Regency reached 30.21% consisting of 6.10% very short and 24.11% short in 2018. This is certainly a problem because according to WHO the maximum tolerance limit for stunting is 20% or one-fifth of the total number of children under five who are growing (Risikesdas, 2018).

Households with sufficient Iodine salt consumption in Indonesia in 2013 were 77.10%. This scope determined increased if it compared to the scope in 2007, which was 62.30%. This scope has not met the USI scope target by WHO and the target of the 2011-2015 National Action Plan for Food and Nutrition (NAPFN) with the respective targets achieved are 90% and 80% (Kemenkes RI, 2013). The results of the 2013 Risikesdas prevalence of IDD reached 11.1%. The results of the 2014 Nutrition Status Monitoring (NSM) reported that household use of iodized salt in South Sulawesi Province was still low at 77.4%. This is a problem because the national target, which is greater than or equal to 90% of households using iodized salt with a quality between 30-80 ppm (Nadimin, 2015).

A study in India by (Paul & Singh, 2020) looking at what affects the inhibition of physical, cognitive development in children (1-12 years) showed that nutritional deficiencies and social environment factors can affect cognitive development in children in India. The results of a study by (Perkins et al., 2017) on the relationship between stunting and child development in low- and middle-income countries found that nearly 40% of children under the age of five experienced a loss of developmental potential, where stunting is one of the main risk factors.

Enrekang Regency is one of the regencies in South Sulawesi which has the 2nd highest Human Development Index (HDI) in South Sulawesi, with 72.15. However, the incidence of stunting is still high. Of course this is inversely proportional to the correlation of high HDI with individual health status. Currently, there is not enough information about the prevalence of IDD in elementary school children in Enrekang Regency. In theory, the high prevalence of stunting in Enrekang Regency will certainly have an impact on decreasing cognitive and motor development. Therefore, the researcher wanted to see if there was a correlation between stunting and poor children with cognitive development, especially for elementary school-aged children in Enrekang Regency.

## Methods

This research used a cross-sectional research design with purposive sampling. The total sample was 100 respondents at the age of 6-12 years. The research was conducted in July – August 2021 in Buntu Batu District, Enrekang Regency, South Sulawesi, Indonesia in 3 villages (Buntu Mondong Village, Potokullin Village, and Latimojong Village). Research variables include the incidence of IDD, Stunting, and Cognitive Development. The data were collected by using a questionnaire covering Family Characteristics, and anthropometric data. Taking urine samples together with palpation examination. This research also examined household salt using the Iodine test. Determination of nutritional status using the WHO AnthroPlus 2007 application and cognitive measurements using the Monterall Cognitive Assessment (Moca- Ina) questionnaire. Data was entered using the SPSS 24 software program, the test used was the Pearson Correlation Analysis test and presented in the form of a table.

## Results and Discussion

There were 100 elementary school students involved in this research. Table 1 shows the characteristic table of data on the frequency distribution of elementary school students. Table 2 shows the frequency of IDD and stunting with cognitive scores. The results showed that the p value = 0.835 ( $P > 0.05$ ) there was no relationship between iodine deficiency disorders in the EYU examination with cognitive development. Similarly, palpation examination showed the value of  $p = 0.724$  ( $P > 0.05$ ). There is a relationship between stunting and cognitive development as seen from the P value = 0.011 ( $P < 0.05$ ).

**Table1.** Frequency Distribution of Elementary School Student Characteristics

ChildrenCharacteristics	Frequency (n)	Percent (%)
Age		
7 Years	11	11.0
8 Years	15	15.0
9 Years	26	26.0
10 Years	31	31.0
11 Years	15	15.0
12 Years	2	2.0
Gender		
Male	51	51.0
Female	49	49.0
Ethnic		
Bugis	11	11.0
Duri	89	89.0

Parent's Education (Father)		
No School	4	4.0
Not completed Elementary School	4	4.0
Completed Elementary School	33	33.0
Completed JHS	34	34.0
Completed SHS	21	21.0
Completed Diploma	4	4.0
Parent's Occupation (Father)		
Does not Work	1	1.0
Planters/farmer	92	92.0
Laborer	1	1.0
Shepherd/farmer	1	1.0
Employee	1	1.0
Civil Servant/TNI/POLRI/BUMN	2	2.0
Lainnya	2	2.0
Health Card Ownership		
Yes	84	84.0
No	16	16.0
Use of Iodine Salt		
Not iodized (0 ppm)	18	18.0
Less iodized (< 30 ppm)	18	18.0
Enough iodized (> 30 ppm)	64	64.0

**Table 2.** Frequencies for IDD and Stunting Categories with Cognitive Development

	Low	Normal	P Value
EYE Examination			0.835 <sup>a</sup>
Weight Deficiency	1	0	
Moderate Deficiency	2	0	
Mild Deficiency	17	1	
Normal	69	10	
Palpation Examination			0.724 <sup>b</sup>
Level 0	88	11	
Level 1	1	0	
Stunting			0.011 <sup>a</sup>

Highlyshort	15	4	
Short	48	5	
Normal	15	2	

Table 1 shows the age of the most respondents, namely 10 years, 31 students (31.0%) and then the most gender, namely male with 51 respondents (51%). Then respondents who have a health insurance card are 84 respondents (84.0%). The number of households that consume non-iodized salt is 36 and 64 households consume iodized salt. The majority of parents' occupations are Planters/Farmers, which is 92%. The highest average of parental education is graduating from junior high school, 34%.

In line with a study by rachim and pratiwi (2017) The gender of toddlers in this study was dominated by men, namely 60 children (56.6%) and the rest (43.4%) were 46 girls. The high use of iodized salt is a program from the government regarding the mandatory use of iodized salt, however, there are still households that do not consume iodized salt. Iodine content in salt can decrease if it is not stored in proper containers such as closed plastic bags, sealed waterproof materials, or closed containers (P. K. Appiah et al., 2020). The average behavior of the Enrekang community is to store the right container so that the iodine content in salt is maintained.

Cognitive or knowledge is a very important domain for the formation of a person's actions in making decisions to behave (Yanti and Nova, 2015). From Table 2, it shows that there are 20 samples of EYU deficit status with low cognitive scores, 69 samples of normal EYU status with low cognitive scores. Only 1 sample of EYU status deficit with normal cognitive scores and 10 samples of EYU status with normal cognitive scores. On palpation, only 1 respondent had grade 1.

Iodine is a micronutrient needed for the formation of the hormone thyroxine (T4) in the thyroid gland. Thyroxine is needed for physical growth and development, including the brain. Severe iodine deficiency that occurs during the first trimester of pregnancy will cause permanent defects in the brain, which in the severest state is called cretinism (Hairunis et al., 2018). The thyroxine hormone itself plays a role in stimulating and regulating the body's metabolic processes including brain development (Campbell et al., 2016).

The absence of a relationship between the incidence of IDD and Cognitive Development is in line with study by (Zhou et al., 2019) looking at the Relationship of Iodine Intake in Pregnant Women and Children's Cognitive Development at the Age of 18 Months. There are three things that influence stunting with poor cognitive development. The first is through direct changes in brain structure or biochemistry, where nutritional deficiencies can alter brain development and impair cognitive function. The second is through caregiver behavior, where caregivers may not provide age-appropriate stimulation for stunted children

because stunted children may appear younger than their actual age. In some cultures, parents are more likely to respond to the initiation of the interaction by the child than to initiate the interaction itself. The third is through children's exploration of the environment (Nurliyana et al., 2020).

There is a relationship between the incidences of stunting with cognitive development. In line with the study of Rajitkar, et.al (2019) in children aged 6-11 months where the Z-score of body length by age is positively related to cognitive scores ( $p < 0.001$ ] and motor scores  $p = 0.001$ . Malnutrition can inhibit cognitive development, chronic malnutrition, is most likely associated with poor cognitive development. Stunting has been considered the best indicator of child health inequality because of its possible long-term impact on cognitive function and economic productivity of adults (Nurliyana et al. 2020).

## **CONCLUSION**

Adequate intake of nutrients plays an important role in the growth and development of children. In this research, there is a relationship between growth disorders (stunting) and development (cognitive). In addition to nutrient intake, parenting and compassion also play an important role in child development.

## **Conflict of interest**

The authors declare no conflict of interest.

## **Confession**

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