

The Impact of Stunted Nutritional Status on Children's Intelligence Levels in Disaster-Prone Areas

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ABSTRACT

Background: The nutritional problems arising post-disaster in Aceh Jaya Regency include health crises such as the cessation of healthcare services, casualties, and injuries among refugees. Other factors contributing to nutritional issues include the availability of clean water, environmental sanitation, and infectious diseases. Disasters create emergency situations that potentially lead to food and nutrition crises. The aim of this research is to investigate the impact of children with stunted nutritional status on the intelligence levels of children in disaster-prone areas.

Method: This study employs an observational research design with a cross-sectional approach. Data collection took place from July 24th to 27th, 2023, in the Sampoinet sub-district of Aceh Jaya Regency, Aceh Province. The sample size was determined to be 92 individuals using purposive sampling technique. Instruments used to measure children's nutritional status include a portable standing height measurement tool (stadiometer), while intelligence assessment of students was conducted using the CPM (Coloured Progressive Matrices) test. Bivariate data analysis was carried out using the chi-square statistical test with a confidence interval of 95%.

Results: The study findings indicate that female children are more likely to have below-average intelligence levels (38.3%) compared to male children with the same intelligence level (22.2%). However, statistical analysis results show no significant relationship between gender and intelligence level. Furthermore, 57.1% of stunted children have below-average intelligence levels compared to children with normal nutrition with the same intelligence level (22.5%). Statistical analysis results indicate that stunted children have an impact on intelligence level ($p=0.009$).

Conclusion: Stunted nutritional status has an impact on the intelligence level of school-age children in the Sampoinet sub-district of Aceh Jaya Regency.

Keyword : Stunting, disaster-prone areas, intelligence level, nutrition

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Background. High-quality human resources (SDM) are influenced by various factors such as health, economic, and educational factors. Health factors include those related to nutritional issues (Azwar, 2014). The quality of human resources, particularly children, in disaster-prone areas should also be a concern. It cannot be denied that families living in disaster-prone areas face serious challenges, as they must confront the threat of disasters that can strike at any time, risking various losses and threatening lives (Irega Gelly Gera, 2015).

One of the areas concerned about disasters is the province of Aceh. This is

because Aceh has a history of major disaster occurrences. Several disasters have occurred, resulting in other subsequent disasters (cascade disasters) that have impacts on multiple sectors (BPBA, 2015). In addition to this, Aceh Province also faces the issue of stunting. In 2018, the incidence of stunting in Aceh Province was 37.9%, which is still above the national average (Kemenkes, 2018). According to data from the Indonesian Nutrition Status Study (SSGI) in 2021, there are 13 areas in Aceh classified under the red category out of 76 areas, one of which is Aceh Jaya Regency (Kemenkes RI, 2021).

The nutritional problems arising post-disaster in Aceh Jaya Regency include health crises such as the paralysis of healthcare services, casualties, and injuries among refugees. Other factors contributing to nutritional issues include the availability of clean water, environmental sanitation, and infectious diseases. Disasters create emergency situations that potentially lead to food and nutrition crises. This occurs because during emergencies, several immediate interventions are necessary, such as addressing cases of malnutrition, undernutrition, and stunting (Salmayati, 2016). According to the report from the BMKG of Aceh Jaya Regency in 2021, Sampoinet sub-district experiences the highest frequency of disasters.

Stunting is closely associated with several long-term consequences, including higher rates of mortality and morbidity, impaired cognitive growth, school performance, learning capacity, work capacity, and work productivity (Ponum et al., 2020). Stunting occurring during school age leads to detrimental effects on intelligence, fine motor skills, psychomotor development, neurosensory integration, and makes children vulnerable to diseases, resulting in decreased levels of self-ability in the future and suboptimal intellectual development (Arfinés & Puspitasari, 2017; Ginting & Pandiangan, 2019).

The results of a literature review study on the impact of stunting on intelligence (IQ) among elementary school-aged children in 2020 revealed findings from the analysis and discussion of the influence of stunting on intellectual intelligence. Out of 15 journals reviewed, 12 journals showed results indicating a relationship between the variables under study, while 3 journals indicated no relationship among the 108 variables under investigation (Mulyana, 2020).

Therefore, this research aims to investigate the impact of children with stunted nutritional status on the intelligence level of children in disaster-prone areas, specifically in the Sampoinet sub-district of Aceh Jaya Regency.

Methods. This observational study employs a cross-sectional design. Data collection took place from July 24th to 27th, 2023, in the Sampoinet sub-district of Aceh Jaya Regency, Aceh Province. The selection of the data collection location was due to the fact that this sub-district is the most disaster-prone area in Aceh Jaya Regency. Data were collected from 11 elementary schools within the Sampoinet sub-district. The population of this study comprises all elementary school students in the Sampoinet sub-district of Aceh Jaya Regency, totaling 1004 individuals. The sample size was 92 determined using the Slovin's formula.

The sampling technique was purposive sampling. The sample criteria include children who can read and write fluently, students in the 4th grade of elementary school to standardize the age and education level of children in each school, and children who have lived in Sampoinet District, Ingin Jaya Sub-district, since birth. During data collection, two teams were formed due to the vast and diverse locations, with each team consisting of research members, assistant psychologists, and local healthcare workers familiar with the data collection sites.

The tool used to measure nutritional status is a portable standing height measurement device (stadiometer). Height measurements are processed using WHO anthropometry plus, and stunting categorization is based on the child's height-for-age index, where stunted ($< -2SD$) indicates malnutrition and normal nutrition ranges between $-1SD$ to $+3SD$. To assess students' intelligence, the Coloured Progressive Matrices (CPM) test, specifically designed for children aged 9-12 years and comprising 36 questions, is administered. Data collection is conducted by assistant psychologists, and the measurement results are subsequently interpreted by psychologists.

IQ scores are divided into three categories: children with superior intelligence, above-average intelligence, children with average intelligence, and children with below-average intelligence and mental retardation fall into the

below-average category. Data analysis conducted using the chi-square statistical test. Chi-square analysis determine association between stunted nutritional status and intelligence levels

Result and Discussion. This research was conducted in the Sampoinet district, which is an area partly located in the mountains and partly on the coastal areas, both of which are prone to disasters, with landslides and floods being common occurrences. Results from interviews with local residents indicate that heavy rainfall for several days can lead to road access to the highway being cut off due to flooding, fallen trees/electric poles, and landslides. Additionally, there are three schools situated in remote areas, making them difficult to reach in case of disasters. Some schools also close during floods because they become submerged.

Table 1. Characteristics of Respondents

Characteristics	N	%
Gender		
Male	45	48,9
Female	47	51,1
Age		
9 years old	55	59,8
10 years old	36	39,1
11 years old	1	1,1
Nutritional Status (H/A)		
Normal	71	77,2
Short (stunted)	21	22,8
Intelligence Level		
Superior	17	18,5
Above Average	16	17,4
Average	31	33,7
Below Average	15	16,3
Mentally Average	13	14,1
Total	92	100

Table 2. The Impact of Stunting on Children's Intelligence Levels

Variable	Intelligence Level						Total		P value
	Above average		Average		Below average		n	%	
	N	%	n	%	n	%			
Gender									
Male	21	44,7	14	0,083	10	22,2	45	48,9	0,083
Female	12	22,5	17	36,2	18	38,3	47	51,1	
Nutritional status									
Normal	29	40,8	26	36,6	16	22,5	71	77,2	0,009
Stunted	4	19	5	23,8	12	57,1	21	22,8	

Based on table 1, the gender distribution of respondents is almost equal, with 45 boys (48.9%) and 47 girls (51.1%). The majority of respondents are 9 years old (54%)

Furthermore, the majority of school children have normal nutritional status based on the TB/U index, with 71 children (77.2%), but 21 children (22.8%) were found to be stunted. Results from intelligence level examinations by psychologists show that the majority of school children have average intelligence levels, with 31 children (33.7%), while 13 children (14.1%) were found to have mentally retarded intelligence levels.

The Impact of Stunting on Children's Intelligence Levels.

The results show that girls have a higher proportion of below-average intelligence levels (38.3%) compared to boys with the same intelligence level (22.2%). However, statistical tests indicate no significant relationship between gender and intelligence level. Furthermore, 57.1% of stunted children have below-average intelligence levels compared to children with normal nutrition with the same intelligence level (22.5%). Statistical tests show that stunted children have an impact on intelligence level ($p=0.009$). According to the WHO Framework, the impact of children with

stunted nutritional status affects their learning performance and self-capacity, hindering their potential (WHO, 2018).

The impact of stunting is a decrease in cognitive function and intelligence in children. (Ginting and Pandiangan, 2019b; Anwar, Winarti and Sunardi, 2022). Results from a cohort study conducted over 10 years on 203 children in India showed that in multivariable analysis, children who experienced stunting at ages 2, 5, and 9 had significantly lower verbal intelligence scores and total Intelligence Quotient (IQ) scores by 4.6 points compared to children who never experienced stunting. Children who experienced catch-up growth after stunting at the age of 2 had higher cognition scores compared to children who experienced continuous stunting throughout their childhood (Koshy et al., 2022). A long-term study in the Philippines indicates that a child's nutrition in early life will affect the intelligence of school-age children until they finish the 6th grade. (Adair et al., 2021).

Stunting can affect children's cognitive development, occurring when a child's brain undergoes rapid growth during the crucial first 1,000 days of life. Stunting can affect a child's mathematics ability by as much as 7%, the ability to write simple sentences may only develop at the age of 8, and stunted children with impaired learning performance may encounter difficulties in completing their education (Irawan R, 2020).

The province of Aceh is one of the disaster-prone areas, with floods and landslides being the most frequent disasters compared to others occurring in the province at the beginning of the year 2023 (BPBA, 2023). Sampoinet district is one of the districts in Aceh Jaya Regency, which is an area where the population is scattered in mountainous and coastal areas. Additionally, there are several villages that are difficult to access. The frequent disasters in this area are landslides and floods. (BPBK Aceh Jaya, 2020). The study on handling toddler nutrition in emergency flood conditions in the Sampoinet District, Aceh Jaya

Regency, concluded that the management of toddler nutrition in flood disaster emergencies has not been specifically addressed. There is a lack of specialized food for toddlers, and the quantity and types of available food are not adequate to meet the nutritional needs of toddlers. Limitations in funding, human resources, and distribution methods can affect the availability of food supplies for toddlers. (Salmayati, Hermansyah and Agussabti, 2016)

Conclusion and Suggestions. Stunted nutritional status has an impact on the intelligence level of school-age children in the Sampoinet sub-district of Aceh Jaya Regency. Stunting can affect a child's mathematics ability by as much as 7%, the ability to write simple sentences may only develop at the age of 8, and stunted children with impaired learning performance may encounter difficulties in completing their education.

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