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Study of Fine Motor Skills Among Children With Stunting

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Abstract*—A long-term malnutrition is the cause of stunting, a chronic nutritional issue. The development of children's fine motor abilities is negatively impacted. The purpose of this study is to compare the fine motor abilities of children who are stunted and those who are not. Methods: At the Babakan community center in Cirebon, an analytical observational study using a cross-sectional design was carried out. Purposive sampling was used to choose 60 participants for the samples. Data from medical records and questionnaires were used to collect research data. Fisher's Exact test was employed in the analysis. Result: 46.7% of responders are men, 36.7% are between the ages of 52 and 60 months, and 78.3% have adequate fine motor abilities. According to the results of the Fisher's Exact comparison test, toddlers who are stunting and those who are not show significant differences in their fine motor skills (p=0.010, PR 5,500: 95% CI 1,331-22,734). Compared to toddlers without stunting, toddlers with stunting are five times more likely to face delays in the development of their fine motor skills. Conclusion: At the Babakan community center in Cirebon Regency, there are notable disparities in the fine motor skills of toddlers who are stunted and those who are not.

Keywords— *Fine Motor Skills, Stunting, Toddler*

I. INTRODUCTION

Stunting is a major chronic nutritional problem in Indonesia, known for causing short stature in individuals. Stunting is primarily caused by prolonged inadequate nutritional intake. Children experiencing malnutrition can impede growth and development, particularly in brain development. The short-term adverse effects of stunting can lead to brain impairment, disruptions in physical growth, intelligence issues, and disruptions in body metabolism. Meanwhile, in the long term, it can result in a decline in cognitive abilities and learning achievements during the school years, decreased immunity making individuals more susceptible to diseases or infections, and reduced productivity, potentially hindering optimal potential.(1–4)

The prevalence of stunted toddlers reported by the World Health Organization (WHO), in 2020, is approximately 22% or around 149.2 million children worldwide are stunted. The prevalence of stunting in the Southeast Asia region in 2020 was 24.1%, with estimated 13.5 million cases. Indonesian Child Nutrition Status Survey (SSGBI) report in 2019, the stunting rate in Indonesia are lowered to 27.7%. In the same year, in West Java, the stunting rate also decreased to 26.21%. Meanwhile, in Cirebon Regency, which is categorized as an area with a high stunting rate, the stunting rate reached 9.36% in 2021.(3,5,6)

Previous study states that toddlers with stunting experience delays in motor development. The impaired motor function in stunted children is related to inhibited maturity of the tricep surae muscles, disrupting mechanical muscle abilities. The effect observed in individuals experiencing stunting is an impediment to motor development. Fine motor skills involve the organization of the use of small muscles, such as those in the fingers, capable of coordinating the hand and eye. In the development of fine motor skills, learning activities such as using old magazines, newspapers, stacking blocks, or scribbling can be implemented. Zinc is a substance that can influence the arborization of cerebellar dendrites associated with motor coordination regulation. (7–9)

There is a lot of studies about stunting in Indonesia. However, studies with a focus on fine motor skills among toddlers with stunting is still lacking. This study aim to

determine the differences in fine motor skills between stunting and non-stunting toddlers. It is hoped that this research can enrich future research data.

II. METHOD

This research was conducted from June to July 2023 in the area of Babakan Public Health Center, Cirebon Regency. The study used an observational analytic method with a cross-sectional approach, utilizing data and observation to examine the differences in fine motor skills between stunted and non-stunted toddlers. The sample selection technique employed in this research was purposive sampling.

The target population for this study was all children in the Babakan Public Health Center area, Cirebon Regency. The accessible population in this study consisted of toddlers aged 3-5 years residing in the Babakan Public Health Center area. The research sample included those who met the inclusion and exclusion criteria. Inclusion criteria for this study were toddlers aged 3-5 years and toddlers residing in the Babakan Public Health Center area. Exclusion criteria included toddlers with congenital disability and toddlers having severe illness. The sample size for this study was 60 toddlers in the Babakan Public Health Center area, Cirebon Regency.

The data collection method utilized both primary and secondary data. Primary data was gathered through the Pre-Screening Development Questionnaire (Kuesioner Pra Skrining Perkembangan - KPSP), while secondary data was obtained from the medical records of the toddlers' height. The height data was then cross-verified directly using a height measurement tool (microtoise).

The KPSP instrument serves as a screening or detection tool applicable at the primary healthcare level. The KPSP is a brief questionnaire addressed to parents and is used for screening the development of toddlers from 3 months to 72 months of age.

Data processing was conducted by univariate and bivariate analysis. Bivariate analysis in this study used non-parametric tests, specifically the Chi-Square test. Bivariate analysis aimed to analyse the differences in fine motor skills between stunted and non-stunted toddlers at Babakan Public Health Center.

This research has obtained Ethical Clearance approval from the Research Ethics Commission of the Faculty of Medicine, Swadaya Gunung Jati University, with the reference number 67/EC/FKUGJ/VI/2023.

III. RESULTS AND DISCUSSION

TABLE VII. PARENTS DEMOGRAPHIC CHARACTERISTIC

Charasteristic	Frequency(n)	Percentage (%)
Mother's Education:		
No Education	1	1,7
Elementary School	18	30,0
Junior High School	31	51,7
Senior High School	10	16,7
Mother's Occupation		
Housewife	51	85,0
Laborer/Farmer	4	6,7
Trader	3	5,0
Employee	2	3,3
Income (Rupiah)		
<1.000.000	6	10,0
1.000.000-1.500.000	31	51,7
1.500.000-2.000.000	21	35,0
>2.000.000	2	3,3
Social and health insurance (BPJS)		
Yes	51	85,0
No	9	15,0

TABLE VIII. SUBJECT DEMOGRAPHIC CHARACTERISTIC

Charasteristic	Frequency(n)	Percentage (%)
Gender		
Female	28	46,7
Male	32	53,3
Toddler Age		
36-41 month	15	25,0
42-47 month	13	21,7
48-51 month	10	16,7
52-60 month	22	36,7
Toddler Group		
Non-Stunting	30	50,0
Stunting	30	50,0
Fine Motoric Skills		
Non appropriate	13	21,7
Appropriate	47	78,3

Table I presents the demographic characteristics of the mothers of toddlers. In the table, it is revealed that the last education level of the parents is Junior High School (SMP) for 31 individuals (51.7%), there are 51 housewives (85.0%), and the family income mostly falls in the range of Rp. 1,000,000-1,500,000 for 31 individuals (51.7%). Additionally, many

families, specifically 51 families (85%), have National Social Security (BPJS)

Table II presents the distribution of characteristics of toddler respondents. Most toddlers are male, totaling 32 individuals (53.3%), while female toddlers amount to 28 individuals (46.3%). It is also found that the population of toddlers in the age range of 52-60 months is the largest group in the study, consisting of 22 individuals (36.7%), and the smallest group is toddlers in the age range of 48-51 months, comprising 10 individuals (16.7%). In terms of stunting classification, there are 30 toddlers in both the stunting and non-stunting groups, each accounting for 50.0%. As for the KPSP assessment results, 47 toddlers (78.3%) have conclusions that appropriate, while 13 toddlers (21.7%) have conclusions that non appropriate the KPSP assessment.

The research shows that most respondents are male. However, the overall risk for male and female children to experience stunting in growth and development is nearly the same. (12–14) The growth golden age occurs during the age range of 52-60 months, while a child is undergoing rapid physical and psychological growth and development. During this phase, toddlers gain experiences from their environment, including the stimulation provided by the adults around them. These experiences and stimuli can significantly influence the child's life in the future.(8,15,16)

At the age of 52-60 months, children enter a period known as the preschool years. During this time, children will learn to be more independent and self-aware. They also develop readiness for school activities, such as following instructions and recognizing letters, while spending a significant amount of their time playing. This aligns with research conducted by Sundayana IM, et al. (2020).(12,13,15,16)

TABLE IX. DIFFERENCE OF FINE MOTORIC SKILLS ON STUNTING AND NON-STUNTING TODDLERS

Variable	**Fine Motoric Skills**				***P value***	**PR (CI 95%)**
	Appropriate		Non Appropriate			
	n	%	n	%		
Group	11	36,7	19	63,3	0,010	5,500 (1,331-22,734)
Stunting						
Non-stunting	2	6,7	28	93,3		

Based on the analysis results in Table III, the Fisher's Exact test yielded a significant P value of 0.010, indicating a significant difference in fine motor skills between stunted and non-stunted toddlers in the Babakan Public Health Center area. Additionally, the calculated PR value is 5.500 (95% CI: 1.331-22.734), meaning that stunted toddlers have a 5.500 times higher risk of experiencing delays in fine motor development compared to non-stunting toddlers. These research findings align with a study conducted by Eka, Putri, and Gina titled "Differences in Fine Motor Development between Stunted and Normal Toddlers in the Working Area of Pegang Baru Community Health Center," which stated a significant difference in fine motor development between stunted and normal toddlers with a p-value of 0.000 (95% CI = 3.785-32.664).(5)

Fine motor skills in stunted children tend to develop slower since structural and functional occurs differently on their brain development. This is due to a maturation delay of nerve cells in the cerebellum, which serves as the center for coordinating motor movements. The cerebellum, being a small part of the brain, plays a crucial role in motor coordination.

Maturation delay of nerve cells in the cerebellum can be attributed to a reduction in the amount of myelin, cortical dendrites in the spinal cord, and a decrease in neurotransmitter synapse. In the first two years after birth are critical period in the brain development of a child. During this period, inadequate nutrition can lead to the shortening of apical dendrites in the brain, resulting in a decline in brain function and affecting the child's motor skills, attention, memory, and cognitive abilities. (17–20)

IV. CONCLUSIONS

There is a developmental delay in the fine motor skills of stunted children as seen by the differences in fine motor skills between stunted and non-stunted toddlers. The small sample size and lack of a procedure to balance the demographics of the stunting and non-stunting samples were limitations of this study. The results of this study indicate that a number of stakeholders, including the national and local governments, medical professionals, village authorities, community health workers, parents, and the community at large, need to pay attention to and coordinate their efforts. In order to prevent developmental delays, especially in fine motor skills, in people impacted by stunting, they should work together to provide attention and training.

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