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THE RELATIONSHIP BETWEEN NUTRITIONAL STATUS AND DEVELOPMENT OF CHILDREN AGE 0-24 MONTHS AT CIMAHI SELATAN HEALTH CENTER

(HUBUNGAN STATUS GIZI DENGAN PERKEMBANGAN BALITA UMUR 0-24 BULAN DI WILAYAH KERJA PUSKESMAS CIMAHI SELATAN)

Yoke Ayukarningsih[1*], Dinar Mutiara[2], Astrid Febrianti[3]

[1]Department of Child Health, Faculty of Medicine, Universitas Jenderal Achmad Yani, Cimahi, Indonesia
[2]Department of Nutritional Sciences, Faculty of Medicine, Universitas Jenderal Achmad Yani, Cimahi, Indonesia
[3]Faculty of Medicine, Universitas Jenderal Achmad Yani, Cimahi, Indonesia

*Corresponding author
yokesuud@yahoo.com

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ABSTRACT

Children with balanced nutritional needs and intake will have good nutritional status, and vice versa; inadequate nutritional intake will affect children's growth and development. This study aims to determine the relationship between nutritional status and the development of children age 0-24 months in the Working Area of the Cimahi Selatan Health Center in a cross-sectional way. Data on nutritional status were measured using a baby scale for body weight and a length board for body length. At the same time, children's development was assessed using the DDST II form, which consisted of four aspects of development: gross motor, fine motor, language, and personal social. There are 30 subjects in this research selected using consecutive sampling techniques. From the results of the study, it was found that disorders of gross motor

development (60.00%), language (100.00%), and personal social (100.00%) were dominant in the 12-24 month age group. In comparison, disorders of fine motor development (33.30%) were found to be equally average in each age group. The results of the analysis showed that there was a significant relationship between aspects of gross motor development (p=0.031), fine motor (p=0.010), language (p=0.045), and personal social (p=0.012) with wasted nutritional status in children 0-24 months in the Cimahi Selatan Health Center Work Area, so it can be concluded that children with wasted nutritional status have a greater risk of experiencing developmental disorders. This result is in line with the theory that inadequate nutritional intake will affect the development process of brain maturity, resulting in a decline in brain function and various delays in child development.

Keywords: child development; DDST II; poor nutritional status (wasted)

ABSTRAK

Anak dengan kebutuhan dan asupan gizi seimbang akan memiliki status gizi baik, begitu pun sebaliknya, asupan gizi tidak adekuat akan memengaruhi pertumbuhan dan perkembangan anak. Penelitian ini bertujuan untuk mengetahui hubungan status gizi dengan perkembangan balita umur 0-24 bulan di Wilayah Kerja Puskesmas Cimahi Selatan secara cross sectional. Data status gizi diukur menggunakan baby scale untuk berat badan dan length board untuk panjang badan, sedangkan perkembangan anak dinilai menggunakan formulir DDST II yang terdiri dari empat aspek perkembangan yaitu motorik kasar, motorik halus, bahasa, dan personal sosial. Subjek penelitian diambil sebanyak 30 sampel dengan teknik consecutive sampling. Dari hasil penelitian didapatkan bahwa gangguan perkembangan motorik kasar (60.00%), bahasa (100.00%), dan personal sosial (100.00%) dominan pada kelompok umur 12-24 bulan, sedangkan gangguan perkembangan motorik halus (33.30%)

didapatkan sama rata pada setiap kelompok umur. Hasil analisis menunjukkan bahwa terdapat hubungan bermakna antara aspek perkembangan motorik kasar (p=0.031), motorik halus (p=0.010), bahasa (p=0.045), dan personal sosial (p=0.012) dengan status gizi kurang (wasted) pada balita 0-24 bulan di Wilayah Kerja Puskesmas Cimahi Selatan, sehingga dapat disimpulkan bahwa anak dengan status gizi kurang memiliki risiko lebih besar mengalami gangguan perkembangan. Hasil ini sejalan dengan teori bahwa asupan gizi tidak adekuat akan memengaruhi proses perkembangan kematangan otak sehingga terjadi penurunan fungsional otak yang mengakibatkan terjadinya berbagai keterlambatan perkembangan anak.

Kata kunci: *DDST II; perkembangan anak; status gizi kurang*

INTRODUCTION

Although Indonesia experienced a decrease in the prevalence of undernutrition among children under the age of five (known as '*Balita*') from 17.83% in 2016 to 17.70% in 2017, undernutrition remains a severe issue in Indonesia year after year.[1] The 2021 Indonesian Nutrition Status Study (SSGI) shows a prevalence of stunted at 20.8%, underweight at 13.6%, and wasted at 7.8%.[2] Cimahi is one of the cities with a high prevalence of undernutrition cases, with the highest prevalence of wasting found at the Cimahi Selatan Community Health Center at 4.92%. The prevalence of stunting is 5.64%, and underweight is 7.11%.[3.] The evaluation of nutritional status can be done by comparing the weight and height assessment results with the child's anthropometric standards.[4] The growth chart used to determine nutritional status based on weight-for-length or weight-for-height index in children under five years old is the WHO 2006 growth chart. The WHO 2006 chart is preferred for assessing the nutritional status of children aged 0-5 years because its methodology is superior to the CDC 2000 chart.[5] The best anthropometric measurement indicator is the weight-for-height or weight-for-length index because it can provide a more specific and sensitive result of nutritional status.[6]

Adequate intake of essential nutrients in terms of quality and quantity

from an early age is one of the factors that influences child growth and development, especially in the age range of 0-24 months.[7] pregnancy up to the age of 24 months is critical for child development; during this period, 80% of the brain is formed and develops faster than at any other time. Therefore, all aspects of development occur rapidly during this period and provide the foundation for further development. Hence, the quality of human resources in the future will decrease if any deviation, no matter how small, is not detected and addressed correctly.[8] Monitoring child development can be done through screening using the Denver Developmental Screening Test (DDST) II test; Denver II is widely used because it is easy to do, has high validity, and has been recognized worldwide.[9]

Developmental delays in children often occur, especially in children who live in slums. The prevalence of developmental delay cases in the United States is reported to be between 12-16%, while in Indonesia, it reaches 13-18%.[10] The high number of cases of developmental delay in children has led researchers to study the factors that affect development, including nutritional status. A study by Oumer *et al.* in Southwest Ethiopia showed that out of 41 children with malnutrition, 19 had normal development, and 22 had developmental delays, specifically delays in gross motor (17.2%), communication (16.8%), problem-solving (13.4%), personal-social (10.8%), and fine motor (10.1%) skills.[11] Another study by Husin et al. showed that wasting is 3.5 times more likely to result in developmental delay.[12] This study aims to analyze the relationship between nutritional status and the development of children aged 0-24 months in Cimahi Selatan Public Health Center.

METHOD

This research was conducted at the Posyandu in Cimahi Selatan Working Area from November to December 2022. The sampling method in this study used a multistage random sampling technique, where samples that met the study criteria were selected in two stages. In the first stage, one Posyandu in the working area of Cimahi Selatan Public Health Center was selected using cluster random sampling. Then, in the second stage, children as research subjects were determined using a non-probability sampling technique with the consecutive sampling method.

The research data is primary data obtained from 30 research subjects, and there are children aged 0-24 months at Posyandu in the Cimahi Selatan Working Area who meet the study inclusion and exclusion criteria. The inclusion criteria in this study were children aged 0-24 months

registered at the Posyandu and accompanied directly by their mothers, who had permitted their children to participate after obtaining informed consent. Exclusion criteria in this study were children with congenital abnormalities, physical disabilities, hormonal disorders (hypothyroidism and Growth Hormone Deficiency (GHD)), history of head trauma during childbirth, history of low birth weight babies (LBW), history of premature birth, history of asphyxia, and children with excess nutritional status (obesity) and children with severely wasted nutritional status.

The independent variable studied in this study was nutritional status. In contrast, the dependent variable studied was child development, which consisted of four aspects: gross motor, fine motor, language, and personal social in children aged 0-24 months. The nutritional status data was obtained through anthropometric measurements using a baby scale and length board, while the child development data was obtained using the Denver II form. The results of nutritional status measurements based on weight-for-length/height were divided into undernourished (wasted) and well-nourished (normal). In contrast, the child development data was divided into normal, abnormal, and suspect in each aspect. The data collected, analyzed, and processed is computerized with the SPSS 25 program. The chi-square test shows the relationship between nutritional status and child development. This study has obtained ethical approval from the Faculty of Medicine Ethics Committee, Universitas Jenderal Achmad Yani, with Number 072/UM1.10/2022, issued on October 28, 2022.

RESULT

Characteristics of respondents based on nutritional status and age

From 30 respondents who were divided into three age groups, children with wasted nutritional status were only found in the age group 12-24 months and 7-11 months; there were three people each (50%), while in the age group 0-6 months there were no children with wasted nutritional status at all. Most children with normal nutritional status were found in the age group of 12-24 months; there are 15 people (62.5%) (Table 1).

Table 1. Distribution of frequency characteristics of respondents based on nutritional status and age

Nutritional status	Age (months)			Total
	0 – 6	7 – 11	12 – 24	

	n	%	n	%	n	%	n	%
Wasted	0	0	3	50	3	50	6	100
Normal	3	12.5	6	25	15	62.5	24	100
Total	**3**	**10**	**9**	**30**	**18**	**60**	**30**	**100**

Gross motor development

The distribution of gross motor development in children aged 0-24 months in the working area of Cimahi Selatan Health Center shows that the majority of children with normal gross motor development are aged 12-24 months, with a total of 14 children (63.6%), while children with abnormal gross motor skills are mostly found at the age of 12-24 months, which is three children (60%). The majority of children with suspected gross motor development are aged 0-6 months, with a total of 2 children (66.7%) and one child (33.3%) aged 12-24 months (Table 2).

Fine motor development

Most normal fine motor development was found in children aged 12-24 months with 16 children (61.5%), while abnormal fine motor development was found in each age group with one child in each group (33,3% each). Children with suspected delicate motor development problems were only found in 12-24 months, with one child (100%) (Table 2).

Language development

This study's results indicate that most children with normal language development were 12-24 months, with 14 children (56%). Children with abnormal language development were only found in the age group of 12-24 months, with two children (100%). Most children with suspected language development were 12-24 months, with two children (66.7%) (Table 2).

Personal social development

Most children with normal personal social development were aged 12-24 months, with 15 children (57.7%). The same thing can be seen in children with abnormal personal-social growth, which shows the majority in the 12-24 months age group, with two children (100%). In children with suspected personal-social development, there were a total of one child (50%) aged 7-11 months and one child (50%) aged 12-24 months (Tabel 2).

Table 2. Frequency distribution of child development

Variable	Age (months)						Total	
	0 – 6		7 – 11		12 – 24			
	n	%	N	%	n	%	n	%

Gross motor								
Normal	1	4.5	7	31.8	14	63.6	22	100
Abnormal	0	0	2	40	3	60	5	100
Suspect	2	66.7	0	0	1	33.3	3	100
Fine motor								
Normal	2	7.7	8	30.8	16	61.5	26	100
Abnormal	1	33.3	1	33.3	1	33.3	3	100
Suspect	0	0	0	0	1	100	1	0
Language								
Normal	3	12	8	32	14	56	25	100
Abnormal	0	0	0	0	2	100	2	100
Suspect	0	0	1	33.3	2	66.7	3	100
Personal social								
Normal	3	11.5	8	30.8	15	57.7	26	100
Abnormal	0	0	0	0	2	100	2	100
Suspect	0	0	1	50	1	50	2	100

Relationship between nutritional status and gross motor development

Most subjects with normal nutritional status have normal gross motor development (83.3%), while most subjects with wasted nutritional status have abnormal gross motor development (50%). The results of the Chi-Square test analysis indicate a significant relationship with a p-value of 0.031 (Table 3).

Table 3. Relationship between nutritional status and gross motor development

Nutritional status	**Gross motor development**						**Total**		***p***
	Normal		**Abnormal**		**Suspect**				
	n	**%**	**n**	**%**	**n**	**%**	**n**	**%**	
Wasted	2	33.3	3	50	1	16.7	6	100	0.031
Normal	20	83.3	2	8.3	2	8.3	24	100	
Total	**22**	**73.3**	**5**	**16.7**	**3**	**10**	**30**	**100**	

Description: p<0.05; there is a significant relationship

Relationship between nutritional status and fine motoric development

The results indicate that most subjects with normal (95.8%) and wasted (50%) nutritional status have normal fine motor development. It does not follow the theory that nutritional status should be in line with child development; wasted nutritional status should've been in line with abnormal fine motor development. However, the Chi-Square Test analysis results show a significant relationship with a p-value of 0.010 (Table 4).

Table 4. Relationship between nutritional status and fine motor development

Nutritional status	Fine motor development						Total		*p*
	Normal		Abnormal		Suspect				
	n	%	n	%	n	%	n	%	
Wasted	3	50	2	33.3	1	16.7	6	100	0.010
Normal	23	95.8	1	4.2	0	0	24	100	
Total	**26**	**86.7**	**3**	**10**	**1**	**3.3**	**30**	**100**	

Description: p<0.05; there is a significant relationship

Relationship between nutritional status and language development

The result showed that most subjects with normal (91.7%) and wasted (50%) nutritional status had normal language development. It is not under the theory that nutritional status should align with child development. However, there is a significant relationship between nutritional status and language development, which shows the results of the Chi-Square test analysis with a p-value of 0.045 (Table 5).

Table 5. Relationship between nutritional status and language development

Nutritional status	Language development						Total		*p*
	Normal		Abnormal		Suspect				
	n	%	n	%	n	%	n	%	
Wasted	3	50	1	16.7	2	33.3	6	100	0.045
Normal	22	91.7	1	4.2	1	4.2	24	100	
Total	**25**	**83.3**	**2**	**6.7**	**3**	**10**	**30**	**100**	

Description: p<0.05; there is a significant relationship

Relationship between nutritional status and social personal development

Although the research results showed that the majority of subjects with normal nutritional status (91.7%) and wasted nutritional status (66.7%) had normal personal social development, the Chi-Square Test analysis showed a p-value of 0.012 (Table 6). It means a significant relationship exists between nutritional status and personal social development in children aged 0-24 months in the working area of Cimahi Selatan Health Center.

Table 6. Relationship between nutritional status and personal social development

Nutritional status	Personal social development						Total		*p*
	Normal		Abnormal		Suspect				
	n	%	n	%	n	%	n	%	
Wasted	4	66.7	2	33.3	0	0	6	100	0.012
Normal	22	91.7	0	0	2	8.3	24	100	

Total	**26**	**86.7**	**2**	**6.7**	**2**	**6.7**	**30**	**100**

Description: p<0.05; there is a significant relationship

DISCUSSION

Child development

The results of this study indicate that children within the age range of 12-24 months tend to have the highest percentage of developmental delay. This finding aligns with the result of Zhang et al., which showed that the highest rate of developmental delay in children was found in the 12-24 months age group. Following the theory, the age range of 12-24 months is a critical period for child development when the child's brain development reaches its peak. Children begin to show more clear independence and ability to speak and socialize at this time, so developmental disorders may begin to appear.[13]

Relationship between nutritional status and gross motor development

The results of this study indicate a significant relationship between nutritional status and gross motor development in children aged 0-24 months. It is in line with the studies conducted by Fitriari *et al*. and Kurniawan *et al*., which showed a significant relationship between nutritional status and gross motor development in children. The results support the theory that malnutrition in children can impact their brain development, especially in the cerebellum, which is the center for coordinating movement and affects the amount of energy needed for physical activity. Children who do not receive adequate nutrition may become weak and inactive and are at high risk for delays or developmental disorders.[714]

Relationship between nutritional status and fine motoric development

This study's results align with the studies conducted by Zulkarnaen and Wari et al., which showed a relationship between nutritional status and fine motor development. The theory explains that adequate nutrition will affect the brain's maturation, which regulates the development of the neuromuscular system, including the nervous system and muscles. Motor control development depends on the formation of specific connections between the corticospinal axon and motor circuits in the contralateral spinal cord, so if this process is disrupted, the child will experience motor developmental disorders.[15,16]

Relationship between nutritional status and language development

Nurwijayanti's study has the same results as this study, both stating that there

is a relationship between language development and children's nutritional status. The study explained that adequate nutrition intake will help children to process stimuli from their environment better. On the other hand, a child's development is directly affected by malnutrition, which can result in several negative effects, including decreased IQ and mental disorders.[17] However, besides nutritional status, various other factors affect children's development, such as genetics, environment, pregnancy conditions, provision of stimulus, and health care. This factor may be why, in the study results, there were children with wasted nutritional status but did not experience developmental delays, and vice versa.[18]

Relationship between nutritional status and social personal development

This study shows a significant relationship between nutritional status and personal-social development in infants aged 0-24 months. This finding is consistent with the findings of Liu et al. and Musniati, which indicate that children with poor nutritional status are more likely to experience impaired personal-social development.[19,20] These results are supported by theories about three mechanisms that affect brain function due to malnutrition and theories about neuroanatomy related to the relationship between personal-social behavior and nutritional status. Malnutrition is increasingly recognized as a factor that may play a role in altering brain function through three independent mechanisms: slowing the growth or development of brain cells (reducing the number of neurons), altering brain neurochemistry (neurotransmitters), and increasing neurotoxicity effects (e.g., combined lead toxicity and malnutrition that can cause more significant impairment in nerve development). Nutritional status also affects the neuroanatomy related to personal-social behavior; brain areas such as the inferior parietal lobule, anterior cingulate gyrus, prefrontal cortex, and temporal-parietal junction, which are associated with social and behavioral characteristics, are known to be highly affected by reduced food intake.[19]

CONCLUSION

Nevertheless, based on the results and discussion, it can be concluded that there is a significant relationship between nutritional status and the gross motor, fine motor, language, and personal social development of children aged 0-24 months in the working area of Cimahi Selatan Health Center.

CONFLICT OF INTEREST

There is no potential conflict of interest reported by the authors.

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REFERENCES

1. Badan Pusat Statistik (BPS). Prevalensi Balita Kekurangan Gizi Menurut Provinsi di Indonesia (PSG) 2016-2018. https://www.bps.go.id/indicator/30/1777/1/prevalensi-balita-kekurangan-gizi-menurut-provinsi-di-indonesia-psg-.html. 2022. [Accessed on June 28, 2022]
2. Kementerian Kesehatan RI. Hasil Survei Status Gizi Indonesia Tahun 2021 tingkat Kabupaten Kota. https://www.slideshare.net/ssuser200d5e/hasil-survey-status-gizi-indonesia-tahun-2021-tingkat-kabupaten-kota. 2021. [Accessed on July 26, 2022]
3. Dinkes Kota Cimahi. Profil Kesehatan Kota Cimahi Tahun 2019. Dinas Kesehatan Kota Cimahi. 2020.
4. Kemenkes RI. Peraturan Menteri Kesehatan Republik Indonesia Nomor 2 Tahun 2020 tentang Standar Antropometri Anak. Nomor 2 Tahun 2020. 2020.
5. Ikatan Dokter Anak Indonesia. Rekomendasi Ikatan Dokter Anak Indonesia : Asuhan Nutrisi Pediatrik (Pediatric Nutrition Care). Paediatric. 2011;3(2):5–6.
6. Septikasari M. Status Gizi Anak dan Faktor yang Memengaruhi. Vol. 1, UNY Press. 2018. 1–80 p.
7. Fitriari TR, Suryawan A, Sulistiawati S. the Effect of Nutritional Status on Gross Motor Skill in Pre School Children. Indonesian Midwifery and Health Sciences Journal. 2021;5(4):417–23.
8. Dahlia JK. Pentingnya Pemantauan Tumbuh Kembang 1000 Hari Pertama Kehidupan Anak. IDAI. https://www.idai.or.id/artikel/klinik/pengasuhan-anak/pentingnya-pemantauan-tumbuh-kembang-1000-hari-pertama-kehidupan-anak. 2017. [Accessed on June 22, 2022]
9. Frankenburg W, Dodds J, Archer P, Bresnick B, Maschka P, Edelman N, et al. Denver II Training Manual. Denver Developmental Materials. https://denverii.com/denver-ii-training-manual/. 2016. [Accessed on August 31, 2022]
10. Yulman AR, Sekartini R, Medise BE, Wirahmadi A, Melina E. Growth and Developmental Delay Risk Factors Among Under-Five Children in an

Inner-City Slum Area. Paediatr Indones. 2019;59(5):276–83.
11. Oumer A, Girum T, Fikre Z, Bedewi J, Nuriye K, Assefa K. Stunting and Underweight, but not Wasting are Associated with Delay in Child Development in Southwest Ethiopia. Pediatric Health Med Ther. 2022;Volume 13(December 2021):1–12.
12. Husin M, Wikananda G, Suryawan IWB. The association between wasting nutritional status and delayed of child development in children age 12 – 60 months in Wangaya General Hospital, Denpasar, Bali. Intisari Sains Medis. 2019;10(2):448–51.
13. Zhang J, Guo S, Li Y, Wei Q, Zhang C, Wang X, et al. Factors influencing developmental delay among young children in poor rural China: A latent variable approach. BMJ Open. 2018;8(8):1–9.
14. Kurniawan K, Mangunatmadja I. Faktor Risiko Eksternal terhadap Keterlambatan Motorik Kasar pada Anak Umur 6 - 24 Bulan: Studi Kasus-Kontrol. Sari Pediatri. 2019;21(1):24–30.
15. Zulkarnaen. The Influence of Nutritional Status on Gross and Fine Motor Skills Development in Early Childhood. Asian Soc Sci. 2019;15(5):75.
16. Wari FE, Yuliani F, Mail E. The Assosiation Between Nutritional Status and Fine Motor Development in Children Aged 36-42 Months. 2022;14(01):27–34.
17. Nurwijayanti N. Hubungan perkembangan bahasa dan status gizi anak di wilayah kerja puskesmas wilayah selatan Kota Kediri. Care: Jurnal Ilmiah Ilmu Kesehatan. https://jurnal.unitri.ac.id /index.php/care/article/view/451. 2017;4 (2):11–21. [Accessed on December 30, 2021]
18. Isnainia Solicha, Na'imah. Faktor yang Memengaruhi Perkembangan Anak Umur Dini. Jurnal Pelita PAUD. 2020;4(2):197–207.
19. Liu J, Raine A. Nutritional status and social behavior in preschool children: the mediating effects of neurocognitive functioning. Matern Child Nutr. 2017;13(2):1–15.
20. Musniati Y. Hubungan Status Gizi dengan Perkembangan Motorik Kasar, Motorik Halus, Personal Sosial, dan Bahasa Pada Anak Umur 1-3 Tahun di Luwu. 2017.