RELATIONSHIP BETWEEN NUTRITIONAL STATUS AND HISTORY OF CHILDBIRTH COMPLICATIONS WITH TODDLERS DEVELOPMENT

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ABSTRACT

Background : Development is an increase in body functions and structures that are more complex in the ability of gross motion, fine motion, speech and language, as well as socialization and independence. More than 200 million children under five are found to be developing not according to age.

Objective : The purpose of this study are to analyze the relationship between nutritional status and child development and to analyze the relationship between history of childbirth complications and child development.

Method : This research was conducted in Bujel, Kediri City. The study began in April 2022. This study was a correlative analytic study. The sample in this study was some of the toddlers in Bujel as many as 45 toddlers. The research data was tested with Spearman's rho.

Result : The results of the Spearman's Rho test between the variables of nutritional status and child development is 0.001, and between history of childbirth complications and child development is 0.024.

Conclusion and Suggestions : The conclusions of this study are there is a relationship between nutritional status and the development of toddlers in Bujel, Kediri City. Another conclusion is that there is a relationship between the history of childbirth complications and the development of children under five in Bujel, Kediri City. It is hoped that the respondent's parents pay more attention to nutritional status so that the child's development is optimal.

INTRODUCTION

Background

Development is an increase in body functions and structures that are more complex in the ability of gross motion, fine motion, speech and language, as well as socialization and independence (Kementerian Kesehatan 2016). Development is related to all things related to changes that occur in children, both physical, cognitive, emotional and psychosocial changes (Sri Asri 2018). Child development is the main focus of productivity throughout a person's life, for example children with cognitive disorders are predictors of low learning achievement who will have the opportunity to have low incomes, making it difficult to provide adequate care for their families in the

future (Amir, Budihastuti, and Murti 2019).

More than 200 million children under five are found to be developing not according to age. Most cases were found in the Sahara region of Asia and Africa (Davidson, Khomsan, and Riyadi 2020). Based on basic health research in 2018, it was recorded that the development index of children aged 3-5 years which was not appropriate reached 11.7% of the total children in Indonesia (Kemenkes RI 2018).

Based on a preliminary study conducted in Bujel, out of 10 toddlers, it was found that 4 toddlers had developmental delays, 2 of them had speech delays, and the remaining 2 had walking delays (gross motor skills). This shows that there is still a high rate of inappropriate child development in this village

Approximately 43% of children under 5 years of age in low- and middle-income countries fail to reach their full developmental potential due to unsafe conditions (e.g., poverty, malnutrition, pollution, and extreme stress), negative interactions (e.g., inappropriate parenting practices, conformity, violence, abuse, neglect, and conflict), and lack of educational opportunities (Li et al. 2019).

Inappropriate development in children can be seen from the emergence of several developmental disorders. These disorders are speech and language disorders, cerebral palsy, Down syndrome, short stature, autism, mental retardation, and Attention and Hyperactivity Disorder (GPPH) (Patel et al. 2016) (Kementerian Kesehatan 2016).

Development is influenced by several things. These include the sex of the child, history of chronic disease, socioeconomic status, nutritional status, and history of childbirth complications (Kementerian Kesehatan 2016).

Based on previous research conducted by Huda (2020) entitled Relationship between Nutritional Status and Development of Pre-School-Age Children in Paud Genuk Ungaran Barat, the results showed that there was a significant relationship between nutritional status and the development of preschool-age children in PAUD Genuk Ungaran Barat (Huda 2020). Another study conducted by Angela (2018) entitled The Influence of Birth History on the Development of Pre-School Children in Surakarta, it was found that birth history in the form of a history of prematurity and low birth weight (LBW) are some of the factors that affect children's development (Angela 2018).

Based on the description above, the authors are interested in researching the relationship between nutritional status and

history of childbirth complications with toddlers development.

Research Problems

Research problems of this study are:

1. Is there a relationship between nutritional status and child development?

2. Is there a relationship between the history of childbirth complications with child development?

Research Purposes

Research purposes of this study are:

1. To analyze the relationship between nutritional status and child development

2. To analyze the relationship between history of childbirth complications and child development

METHODS AND MATERIALS

This research was conducted in Bujel, Kediri City. The study began in April 2022. This study was a correlative analytic study. Sampling was done by simple random sampling technique, and obtained 45 respondents.

After obtaining a statement of ethical eligibility (No:09/EC/KEPK-UNIK/03/2022), the researcher collected data. Data collection procedure begins with approaching and giving an explanation to respondent's parents about the purpose, objectives and benefits of the research to be carried out, then asks the respondent's

parents to fill out an approval letter and sign the consent form to become a respondent.

The next is measuring the nutritional status of toddlers. The tools used to measure nutritional status are scales and height gauges. According to *Deteksi Dini Tumbuh Kembang* (DDTK), nutritional status is classified into Overweight, Normal, Thin, Very Thin.

The next is recording the history of childbirth complications. The instrument used to measure the history of childbirth complications is to use a questionnaire. Childbirth complications were classified no complication and with complication.

The last is measuring the child's development. Measurement using developmental pre-screening questionnaire (Kuesioner Pra Skrining Perkembangan / KPSP). Classification of child development according to DDTK is Normal, Suspect, and Delay.

After all data has been collected, data processing and analysis are carried out. The research data was tested with Spearman's rho with $\alpha = 5\%$.

RESULTS AND DISCUSSION

The research data are presented in Tables 1, 2, and 3. Table 1 contains the characteristics of children. Table 2 is data on the nutritional status of children, history of childbirth complications, and child

development. Table 3 contains the results of Spearman's Rho test.

Table 1. Result Data of Respondent Characteristics

No.	Characteristics	Frequency	Percentage (%)
1	Child's age		
	Toddler (1 - 3 years)	34	76
	Preschool (4-5 years)	11	24
2	Child's Gender		
	Male	25	56
	Female	20	44
3	Parent's Education		
	Elementary Education Level (SD, SMP)	8	18
	Secondary Education Level (SMA)	34	76
	Higher Education Level (College, etc)	3	6
4	Parent's income		
	<1.5 Million	6	13
	<2.5 Million	13	29
	<3.5 Million	18	40
	<5 Million	8	18

Based on table 1, it can be seen that in terms of the age characteristics of children, almost all respondents (76%) are 1 -3 years old (toddler). Most of the respondents (56%) were male. Almost all of the respondents' parental education (76%) was at the secondary education level. Almost half of the income of the respondent's parents is in the range above 2.5 - 3.5 million.

Table 2. Result Data about The Nutritional Status of Children, History of Childbirth Complications, and Child Development

No.	Information	Frequency	Percentage (%)
1	Nutritional Status of Children		
	Normal	37	82
	Over weight	7	16
	Thin	1	2
2	History of Childbirth		

		41	91
	Complications		
	No Complications	41	91
	With Complications	4	9
3	Child Development		
	Normal	39	87
	Suspect	6	13

Based on table 2, it can be seen that in the variable of children's nutritional status, almost all respondents (82%) are normal. In the variable history of labor complications, almost all (91%) of respondents had no complications of childbirth. In the variable of child development, almost all respondents (87%) had normal development.

Table 3. Spearman's Rho test results

No.	Variable	Child Development		
		α	P value	Correlation coefficient
1	Nutritional Status of Children	0.05	0.001	0.485
2	History of Childbirth Complications	0.05	0.024	0.337

Based on table 3, the results of the Spearman's Rho test between the variables of nutritional status and child development is 0.001. This value is smaller than the alpha value, so it can be said that there is a relationship between nutritional status and child development. The correlation coefficient value is 0.485 (+). This shows the strength of the relationship is quite strong. The direction of the relationship is positive, so it can be interpreted that the better the nutritional status of the child, the better the child's development will be.

Nutrition is one of the most important components in supporting the continuity of the growth and development process (Black, Trude, and Lutter 2020). Nutrients become a necessity to grow and develop during the growth period. Nutritional status is the state of the body as a result of food consumption and use of nutrients (del Río et al. 2019).

Based on table 2, it can be seen that in the variable of children's nutritional status, almost all respondents (82%) are normal. This normal nutritional status is supported by several things, including education and parental income.

Based on table 1, it can be seen that almost all parents have a secondary education level. With this level of secondary education, parents will understand the importance of adequate nutrition for child development. Based on table 1, we can also see that almost half of the total respondents have parents with income above Rp. 2,500,000.00 - Rp. 3,500,000.00. This income is sufficient to provide adequate nutrition to support child development.

Health and well-being in adults stems from genetic-environmental interactions that last from conception to 24 months of age (first 1000 days) and continue until 5 years of age (second 1000 days) (Black, Pérez-Escamilla, and Rao 2015). Children with adequate nutrition, nurturing, and opportunities for early learning have the best chance of developing. Even in the face of biological or environmental threats, adequate nutrition, nurturing, and learning can provide protection. On the other hand, the lack of these important factors can undermine the individual potential of children, and the potential of the whole society(Schnepp and Hurlock 2019).

Appropriate nutritional status has a positive impact on cell growth and development, one of which is brain cells so that the brain is able to coordinate every function of the body (Georgieff, Ramel, and Cusick 2018). One of these functions is gross and fine motor development according to the age of the baby or toddler to carry out activities according to the stage of development (Schwarzenberg and Georgieff 2018).

Good nutritional status will have an impact on the growth and maturity of organs, one of which is the brain. Because the brain gets an adequate supply of nutrients, so the brain can function optimally (Ottolini et al. 2020).

The three basic functions of the brain are regulatory, processing and formulation functions. Regulatory functions are responsible for energy levels and overall cortex tone (Koban et al. 2021). Process functions, located behind the cortex, control information analysis, encoding and storage. The formulation process, located in the

frontal lobe, is responsible for the formation of intentions and behavior (Mukamel and Ngai 2019).

One part of the brain that regulates motor function is in the Primary Somatomotor Cortex (area 4) (Mukamel and Ngai 2019). Area 4 is considered the origin of voluntary movement, sending motor impulses to the muscles via the pyramidal tract and anterior horn cells of the spinal cord. This area receives input from other areas of the brain that are involved in planning and initiating voluntary movements, in particular the ventro-oral posterior nucleus of the thalamus, premotor areas 6 and 8, and the somatosensory area. In addition to area 4, another part that regulates motor function is the premotor cortex. The premotor cortex is the command center for planning and selecting motor programs which are then executed by the primary motor cortex. Just as the unimodal association areas adjacent to the primary somatosensory, visual, and auditory cortex are known to store sensory impressions, so the premotor cortex is known to store premotorized motor processes. studied, in cooperation with the cerebellum and basal ganglia (Ille et al. 2021)

In most humans, the language area of the brain is located in the left cerebral hemisphere. The left hemisphere of the child's brain has three main areas specifically for language, in the anterior there is the Brocca area and the motor cortex, while in the posterior there is the Wernicke area. Brocca's area is located in the inferior frontal gyrus between the anterior and posterior ascending ramus of the lateral fissure. This area serves to generate motor patterns in the larynx, respiratory system, and muscles for speech. While the area of the brain that functions in the formation of articulation is called the insula area. Brocca's area communicates with Wenicke's area via the arcuate fasciculus. Wernicke's area serves as the center for language comprehension. During the process of speaking, Wernicke's area works in understanding language and Brocca's area regulates the production of sounds that will be issued. Then the brocca area will send this information to the motor area for the execution of speech

production movements (Friederici and Gierhan 2013) (Leisman, Moustafa, and Shafir 2016).

The brain is a very important organ to regulate child development. Adequate nutrition will greatly support the brain to function properly, especially those related to child development. So that nutrition is very influential on the development of children

Based on table 3, we can also seen the results of the Spearman's Rho test between the variables of history of childbirth complications and child development is 0.024. This value is smaller than the alpha value, so it can be said that there is a relationship between history of childbirth complications and child development. The correlation coefficient value is 0.337 (+). This shows the strength of the relationship is quite strong. The direction of the relationship is positive, so it can be interpreted if the pregnancy history is good, the child's development will be better.

Types of labor complications include asphyxia and prematurity. Infants with perinatal asphyxia have a high risk of experiencing pain. Brain damage in asphyxiated infants is considered the main cause of developmental disorders (Ellenberg and Nelson 2013). Perinatal asphyxia is a cause of Attention Deficit Hyperactivity Disorder (ADHD), and the incidence of ADHD is more common in children with a history of low APGAR scores (Palareti et al. 2016).

Premature birth is closely related to the occurrence of delays in children's language. Child language affect children's communication, resulting in decreased academic achievement and social functioning. Premature children are weaker in the field of language which includes grammar, dialogue and perceiving a speech than term children their age. Premature children will experience emotional social problems such as low social relations and lack of interaction with the surrounding environment (Cassiano, Gaspardo, and Linhares 2016).

CONCLUSIONS AND SUGGESTIONS

Based on the results of the study, it can be concluded that there is a relationship between nutritional

status and the development of toddlers in Bujel, Kediri City. Another conclusion is that there is a relationship between the history of childbirth complications and the development of children under five in Bujel, Kediri City. The results of this study support previous research entitled Relationship between Nutritional Status and Development of Pre-School-Age Children in Paud Genuk Ungaran Barat and The Influence of Birth History on the Development of Pre-School Children in Surakarta.

The contribution of research results in pediatric nursing practice is as a reference in the implementation of early detection of child development, so that this can prevent delays in child development

It is hoped that the respondent's parents pay more attention to nutritional status so that the child's development is optimal. Suggestions for further research, it is better to conduct research on the effect of gender and birth weight on child development

REFERENCES

Amir, Nikmah Ayu Ramadhani, Uki Retno Budihastuti, and Bhisma Murti. 2019. "Factors Associated with Development in Children Under Five." *Journal of Maternal and Child Health* 04(01):40–48. doi: 10.26911/thejmch.2019.04.01.06.

Angela, Silfia. 2018. "Pengaruh Riwayat Lahir Terhadap Perkembangan Anak Prasekolah Di Surakarta." *Jurnal Wawasan Kesehatan* 3(2):51–56.

Black, Maureen M., Rafael Pérez-Escamilla, and Sylvia Fernandez Rao. 2015. "Integrating Nutrition and Child Development Interventions: Scientific Basis, Evidence of Impact, and Implementation Considerations." *Advances in Nutrition* 6(6):852–59. doi: 10.3945/an.115.010348.

Black, Maureen M., Angela C. B. Trude, and Chessa K. Lutter. 2020. "All Children Thrive: Integration of Nutrition and Early Childhood Development." *Annual Review of Nutrition* 40:375–406. doi: 10.1146/annurev-nutr-120219-023757.

Cassiano, Rafaela G. M., Claudia M. Gaspardo, and Maria Beatriz M. Linhares. 2016. "Prematurity, Neonatal Health Status, and Later Child Behavioral/Emotional Problems: A Systematic Review." *Infant Mental Health Journal* 37(3):274–88. doi: 10.1002/imhj.21563.

Davidson, Sarah Melati, Ali Khomsan, and Hadi Riyadi. 2020. "Status Gizi Dan Perkembangan Anak Usia 3-5 Tahun Di Kabupaten Bogor." *Jurnal Gizi Indonesia (The Indonesian Journal of Nutrition)* 8(2):143–48. doi:

10.14710/jgi.8.2.143-148.

Ellenberg, Jonas H., and Karin B. Nelson. 2013. "The Association of Cerebral Palsy with Birth Asphyxia: A Definitional Quagmire." *Developmental Medicine and Child Neurology* 55(3):210–16. doi: 10.1111/dmcn.12016.

Friederici, Angela D., and Sarah M. E. Gierhan. 2013. "The Language Network." *Current Opinion in Neurobiology* 23(2):250–54. doi: 10.1016/j.conb.2012.10.002.

Georgieff, Michael K., Sara E. Ramel, and Sarah E. Cusick. 2018. "Nutritional Influences on Brain Development." *Acta Paediatrica, International Journal of Paediatrics* 107(8):1310–21. doi: 10.1111/apa.14287.

Huda, Jamal. 2020. "Hubungan Status Gizi Dengan Perkembangan Anak Usia Prasekolah Di PAUD Genuk Ungaran Barat." *Journal of Chemical Information and Modeling* 53(9):1689–99.

Ille, Sebastian, Maximilian Schwendner, Wei Zhang, Axel Schroeder, Bernhard Meyer, and Sandro M. Krieg. 2021. "Tractography for Subcortical Resection of Gliomas Is Highly Accurate For Motor and Language Function: Iomri-Based Elastic Fusion Disproves the Severity of Brain Shift." *Cancers* 13(8):1–12. doi: 10.3390/cancers13081787.

Kemenkes RI. 2018. "Hasil Riset Kesehatan Dasar Tahun 2018." *Kementrian Kesehatan* 53(9):1689–99.

Kementerian Kesehatan. 2016. *Pedoman Pelaksanaan Stimulasi, Deteksi Dan Lntervensi Dini Tumbuh Kembang Anak Ditingkat Pelayanan Kesehatan Dasar.*

Koban, Leonie, Peter J. Gianaros, Hedy Kober, and Tor D. Wager. 2021. "The Self in Context: Brain Systems Linking Mental and Physical Health." *Nature Reviews Neuroscience* 22(5):309–22. doi: 10.1038/s41583-021-00446-8.

Leisman, Gerry, Ahmed A. Moustafa, and Tal Shafir. 2016. "Thinking, Walking, Talking: Integratory Motor and Cognitive Brain Function." *Frontiers in Public Health* 4(May):1–19. doi: 10.3389/fpubh.2016.00094.

Li, X., Q. Yue, S. Wang, H. Wang, J. Jiang, L. Gong, W. Liu, X. Huang, and T. Xu. 2019. "Challenges in Early Childhood Development." *Child: Care, Health and Development* 43(6):869–75. doi: 10.1111/cch.12503.

Mukamel, Eran A., and John Ngai. 2019. "Perspectives on Defining Cell Types in the Brain." *Current Opinion in Neurobiology* 56:61–68. doi: 10.1016/j.conb.2018.11.007.

Ottolini, Katherine M., Nickie Andescavage, Susan Keller, and Catherine Limperopoulos. 2020. "Nutrition and the Developing Brain: The Road to Optimizing Early Neurodevelopment: A Systematic Review." *Pediatric Research* 87(2):194–201. doi: 10.1038/s41390-019-0508-3.

Palareti, G., C. Legnani, B. Cosmi, E. Antonucci, N. Erba, D. Poli, S. Testa, and A. Tosetto. 2016. "Birth Asphyxia and Attention Deficit Hyperactivity Disorder."

International Journal of Laboratory Hematology 38(1):42–49. doi: 10.1111/ijlh.12426.

Patel, Vikram, Dan Chisholm, Tarun Dua, Ramanan Laxminarayan, and Maria Elena Medina-Mora. 2016. "Disease Control Priorities, Third Edition (Volume 4): Mental, Neurological, and Substance Use Disorders." *Disease Control Priorities: Mental, Neurological, and Substance Use Disorders* 4(May). doi: 10.1596/978-1-4648-0426-7.

del Río, Nazaret Gómez, Carina S. González-González, Raquel Martín-González, Vicente Navarro-Adelantado, Pedro Toledo-Delgado, and Francisco García-Peñalvo. 2019. "Effects of a Gamified Educational Program in the Nutrition of Children with Obesity." *Journal of Medical Systems* 43(7). doi: 10.1007/s10916-019-1293-6.

Schnepp, Gerald J., and Elizabeth B. Hurlock. 2019. "Child Growth and Development." *The American Catholic Sociological Review* 11(2):104. doi: 10.2307/3707488.

Schwarzenberg, Sarah Jane, and Michael K. Georgieff. 2018. "Advocacy for Improving Nutrition in the First 1000 Days to Support Childhood Development and Adult Health." *Pediatrics* 141(2). doi: 10.1542/peds.2017-3716.

Sri Asri, AA. 2018. "Hubungan Pola Asuh Terhadap Perkembangan Anak Usia Dini." *Jurnal Ilmiah Sekolah Dasar* 2(1):1. doi: 10.23887/jisd.v2i1.13793.