



History of Fish-Based Complementary Food Provision Toward Children's Cognitive Level in Elementary School

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Abstract

Background: Nutritional components contained in fish like essential fatty acid might support the growth and development of children's brain. Therefore, it's better to give it as early as possible at the age of 6-24 months as complementary food because this age was the ideal age for the growth and development of children's cognitive intelligence. The aim of this study was to find out the correlation between fish-based complementary food history with children's cognitive level.

Methods: This study used cross sectional design with 59 students from 4th grade Budya Wacana Elementary School Yogyakarta were selected as participant in this study. Data were collected by IQ test (CFIT 2B scale) and validated questionnaire.

Results: Statistical bivariate analysis by spearman rank test showed a correlation between fish-based complementary food history ($p = 0.031$), parental assistance ($p = 0.022$), exclusive breastfeeding history ($p < 0.01$) with children's cognitive level. There were no correlation between parenting style ($p = 0.683$), mother's knowledge about complementary food ($p = 0.374$), and education ($p = 0.902$) with cognitive level. Statistical analysis by logistic regression test showed that exclusive breastfeeding history ($p = 0.03$) has stronger correlation to cognitive level compared to fish-based complementary food history ($p = 0.155$) and parental assistance ($p = 0.167$).

Conclusion: There is correlation that is clinically significant but not statistically significant between fish-based complementary food history and parental care with children's cognitive level. Exclusive breastfeeding history has a stronger correlation that clinically and statistically significant to children's cognitive level.

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BACKGROUND

Fish-based complementary food is weaning food given to children aged 6-24 months to support children's growth and development. Fish-based complementary food mostly contained essential fatty acids in the form of omega-3 and DHA (Docosahexaenoic Acid) which play roles in the process of brain growth and development, improve nerve work, brain intelligence, and memory (Andriani & Wirjatmaji, 2012). In addition, consumption of EPA and DHA can also reduce the risk and prevent several diseases including arthritis, inflammation, cancer, and psychological conditions (Larsen, Eilertsen, & Elvevoll, 2011). Factors that influence children's cognitive level are genetic and environmental factors. Genetic factors are factors that are derived directly from parents. Environmental factors are factors that can be manipulated. Environmental factors consist of 3 aspects, namely fostering, compassion, and sharpening. Foster care is related to parenting and nutrition given. Compassion is related to the love given by parents so that it can affect children's growth and cognitive development. Sharpening is related to stimulation that can stimulate growth and cognitive development (Soetjningsih, 2013). This study aimed to find out the correlation between fish-based complementary food history with children's cognitive level

METHODS

This study used a correlative analytic design with cross sectional design. The study population was a number of 152 students from Budya Wacana Elementary School Yogyakarta.

Sample was 59 students from 4th grade Budya Wacana Elementary School Yogyakarta. The independent variables in this study are parenting, mother's knowledge about complementary foods for breast milk, the implementation of parental affection, the implementation of formal and informal education, and exclusive breastfeeding history. The dependent variable is the cognitive level of students as measured by IQ tests. This study used bivariate data analysis of spearman rank test to determine the correlation of independent and confounding variables with dependent variables and multivariate data analysis of logistic regression test to determine the variables that most influence the cognitive level of children.

RESULTS AND DISCUSSION

Table 1 shows the data distribution of the implementation of parenting in 4th grade Budya Wacana Elementary School Yogyakarta, most of the students, 42 students (71.2%) had enough parenting. Students who received less parenting were 11 (18.6%) students, while 6 (10.2%) students got good parenting. The distribution of mother's knowledge about complementary foods for breast milk was mostly (52.5%) mothers, with a total of 31 people having good knowledge about fish-based complementary food. Mothers who had poor knowledge about complementary foods for breast milk were 28 (47.5%) people. The distribution of the implementation of parental affection to the 4th grade students of Budya Wacana Elementary School Yogyakarta shows that students left for ≤ 6 hours were 35 (59.3%) and students who were left by mothers for > 6 hours were 24 (40.7%).

Distribution of the implementation of formal (in school) and informal (outside school) education to 4th grade students of Budya Wacana Elementary School Yogyakarta is known that students who only got formal education were only 39 (66.1%) students. Students who got formal and informal education were 20 (33.9%) students. The distribution of history of exclusive breastfeeding to 4th grade students of Budya Wacana Elementary School Yogyakarta revealed that students who received exclusive breastfeeding were 39 (66.1%) and those who did not get exclusive breastfeeding as much as 20 (33.9% 3). Distribution of IQ test results for 4th grade students of Budya Wacana

Elementary School Yogyakarta, which are divided into 8 categories, shows that most students get IQ test results on average, which was 22 (37.3%) students. Students who got IQ test results in very intelligent category were 3 people (5.1%). Students who get IQ test results in the smart category were 7 people (11.9%). Students who get IQ test results with category above the average were 15 people (25.4%). Students who get IQ test results with category below the average were 6 people (10.2%). Students who get IQ test results in borderline categories were 5 people (8.5%). Students who get IQ test results in the mentally defective category were 1 person (1.7%).

Table 1. Distribution of respondents based on variables

Variables	Categories	Frequency	Percentage
Parenting	Less	11	18,6%
	Enough	42	71,2%
	Good	6	10,2%
Mother's knowledge about complementary food	Less	28	47,5%
	Good	31	52,5%
Implementation of parental care	Left by the mother for ≤ 6 hours	35	59,3%
	Left by the mother for > 6 jam	24	40,7%
Implementation of formal and informal education	Only get formal education	39	66,1%
	Get formal and informal education	20	33,9%
History of exclusive breastfeeding	Complete exclusive breastfeeding	39	66,1%
	Incomplete exclusive breastfeeding	20	33,9%
IQ test results	<i>Mentally defective</i>	1	1,7%
	<i>Borderline</i>	5	8,5%
	Below average	6	10,2%
	Average	22	37,3%
	Above average	15	25,4%
	Smart	7	11,9%
	Highly intelligent	3	5,1%

Table 2. Results of the correlation between the history provision of fish-based complementary food, the history of exclusive breastfeeding and maternal care or compassion with cognitive level

Variables	Cognitive level							<i>p</i> <i>value</i>	Correlation coefficient (<i>r</i>)
	<i>Mentally defective</i>	<i>Borderline</i>	<i>Below average</i>	<i>Average</i>	<i>Above average</i>	<i>Smart</i>	<i>Highly intelligent</i>		
Never	1	2	3	9	1	2	0	0,031	0,280
Few times	0	0	0	5	4	0	1		
Rare	0	2	3	4	9	2	1		
Often	0	1	0	4	1	3	1	0,022	0,298
≤6 hours	1	4	6	6	3	0	1		
> 6 hours	0	1	1	16	12	7	2		
Exclusive breastfeeding	1	3	4	9	5	2	0	<0,01	0,459
No exclusive breastfeeding	0	2	2	13	10	5	3		

Table 3. Result of the correlation between parenting, the provision of additional education (sharpening), maternal knowledge about complementary foods for breast milk with cognitive level

Variables	Cognitive level							<i>p</i> <i>value</i>	Correlation coefficient (<i>r</i>)
	<i>Mentally defective</i>	<i>Borderline</i>	<i>Below average</i>	<i>Average</i>	<i>Above average</i>	<i>Smart</i>	<i>Highly intelligent</i>		
Less	0	1	2	4	2	2	0	0,683	-0,054
Enough	1	2	3	17	11	5	3		
Well	0	2	1	1	2	0	0		
Formal	1	4	4	13	9	5	3	0,90 2	-0,16
Formal & informal	0	1	2	9	6	2	0		
Less	0	3	3	11	9	2	0	0,37 4	0,118
Good	1	2	3	11	6	5	3		

Table 4. Results of multivariate analysis between history of fish-based complementary food provision, compassion, and history of exclusive breastfeeding with the cognitive level

Variables	Model I		Model II		Model III	
	<i>p value</i>	<i>r</i> ²	<i>p value</i>	<i>r</i> ²	<i>p value</i>	<i>r</i> ²
Fish-based complementary food	0,155		0,108			
Compassion	0,167	0,608		0,543	0,096	0,412
Exclusive breastfeeding	0,03		0,005		0,001	

Based on table 2, the *p* value for the history of fish-based complementary food provision was obtained, the history of exclusive breastfeeding and maternal care or affection (compassion) <0.05,

meaning that there was a significant correlation between fish-based complementary food history, exclusive breastfeeding history and maternal care or affection for the cognitive level of the child.

Based on table 3, it can be seen that, the p value on the parenting variables, maternal knowledge about fish-based complementary foods, and the provision of additional education (sharpening) >0.05 , meaning there was no significant correlation between parenting, maternal knowledge about fish-based complementary foods, and giving additional education (sharpening) to the cognitive level of the child.

Based on table 4, it can be concluded that the history of exclusive breastfeeding had the greatest influence on the cognitive level of the child. The multivariate table shows that the history of exclusive breastfeeding had the most significant correlation to the cognitive level with p value = 0.005 and $r^2 = 0.543$ which meant 54.3% of the cognitive level was influenced by a history of exclusive breastfeeding and a history of fish-based complementary food provision so that can be used as a reference to find out the variables which has highest influence to children's cognitive level.

The results of the study with the spearman rank bivariate analysis showed that there was a significant correlation between cognitive level with history of fish-based complementary food provision. Fish-based complementary food has protein content consisting of essential fatty acids, namely omega-3 and DHA (Docosahexaenoic Acid) which functions to process brain growth and development, so that the intake of omega-3 and DHA has a very important role for children's

intelligence in the future (Andriani & Wirjatmaji, 2012).

The results of the analysis of this study indicate that there was no significant correlation between parenting, mother's knowledge about fish-based complementary food provision and the provision of additional education (sharpening) to the cognitive level. The results of other studies state that parenting is more influential on emotional or affective intelligence than children's intellectual or cognitive intelligence (Aghili & Kashani, 2011; Hidayah, Yunita, & Wiji Utami 2013). The provision of additional education (sharpening) also does not affect intellectual intelligence. Group guidance (informal group tutoring) is effective for increasing students' emotional or affective intelligence, so it does not significantly affect children's cognitive (Nurnaningsih, 2011).

Based on the results of the analysis, there was a significant correlation between fish-based complementary food provision, the history of exclusive breastfeeding and maternal care or compassion to the cognitive level. Exclusive breastfeeding increases intellectual intelligence in all aspects of figures, verbal and numerical. The concentration of long chain unsaturated fatty acids that are useful for brain growth and development and Insulin like growth factor I (IGF-I) which play a role in the growth of children and have anabolic effects or build new cells and maintain body tissue in adults, more contained in breast milk rather than formula milk (Kramer et al., 2008).

Mother's care or compassion has a significant correlation with children's cognitive. Parental care patterns, namely maternal support in feeding practices, psychosocial stimuli, hygiene practices, and toddler health care influence the

nutritional status of children in which the nutritional status of these children can affect children's cognitive development (Amalia, 2016). Mother's care or compassion has a significant correlation with children's cognitive and emotional intelligence. Parents are the first fostering place in a child's life. The best condition for children is a condition full of happiness and enthusiasm which is a condition where they have harmonious interpersonal relationships. Circumstances that are full of support help children develop all their potential, put all their skills and talents to full use (Meriyati, 2014).

The results of multivariate analysis of logistic regression showed that history of exclusive breastfeeding had a greater influence on cognitive level compared to a history of fish-based complementary food provision and maternal care or compassion. Fish-based complementary food is indeed a nutrient that can optimize the growth and cognitive development of children, but there are other factors that are more influential on cognitive such as maternal care or affection (compassion), exclusive breastfeeding history, genetics, and other factors (Soetjiningsih, 2013).

The nutrient components contained in breast milk influence the development of behavior and cognitive of children. One of the most important substances in terms of children's behavioral and cognitive development is taurine, an amino acid derivative found in breast milk, the most abundant amino acid in the brain, retina, muscle tissue, and other organs throughout the body (Ripps & Shen, 2012). Different studies have found that high-educated mothers have a greater chance of having high-intelligence children than mothers who give exclusive breastfeeding. This

study states that each individual is a hereditary product that inherits genetic characteristics from parents and environmental factors so that children's intelligence will be inherited from the mother and influenced by the education of the mother of the child (Said & Pratomo, 2013).

CONCLUSION

There is correlation that is theoretically significant but not statistically significant and relatively weak correlation between history of fish-based complementary food and compassion or parental care with children's cognitive level. There is correlation that is theoretically and statistically significant and relatively strong correlation between exclusive breastfeeding with children's cognitive level.

For mothers it is recommended to give exclusive breastfeeding to 0-6 months old children. Parents are advised to provide care or affection for children during the growth period and are advised to give fish-based complementary food at the age of 6-24 months.

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