



Study in Iodine-Deficient Areas: What Factors Influence Motor Development in Children Under Two Years old?

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Abstract

Background: Iodine deficiency areas usually occur in highlands above 600 meters above sea level. Iodine is an essential material for thyroid hormones, which plays a role in metabolic stability and organ function. Iodine deficiency is the main cause of Iodine Deficiency Disorders (IDD), which affect children's growth and development issues that affect the motor development of children under two years old in iodine-deficient areas.

Methods: 46 respondents participated in a cross-sectional study with iodine deficiency in Magelang Regency. In this study, five independent variables were examined: wasting, stunting, underweight, age, mother knowledge, mother's education, mother's occupation, gender, and parenting styles. Meanwhile, the dependent variable is motoric development. The author uses a logistic regression test at the final stage.

Results: Bivariate analysis showed that gender, underweight, and stunting were significantly related to the motoric development of children—under two years old with a p-value <0.05. Multivariate analysis showed that iodine deficiency in under two years old who experienced underweight and stunting, had a significant effect on child motoric development.

Conclusion: Stunting, underweight, and gender are factors that affect the motor development of children under two years old in iodine deficient areas. Children under two years old who are underweight have a risk of delayed motoric development of 14,222 times compared to those who are not underweight, and children under two years old who are stunted have a risk of 16,915 times compared to those who are not stunted.

Keywords: Factors, Iodine, Motoric development

Introduction

Children under two years old are in a critical period of growth and development, one of which is marked by increased motor development. Motor development is the ability to move that involves coordination between the nervous system, bones, and muscles. The growth and development of children under two years old are influenced by the intake of food nutrients, including the micronutrient iodine, which is very important for the body's metabolism. Iodine is the main raw material in the production of thyroid hormones. Thyroid hormones are crucial for nerve growth and control the body's metabolic processes (1). Early childhood and pregnancy iodine deficiency can result in neurocognitive problems. Studies show that children in areas with iodine deficiency exhibit delayed psychomotor development (2).

Long-term iodine intake deficiency is one cause of thyroid disease. Women who are pregnant or nursing should consume no more than 250 μg of iodine per day, while the requirement for infants up to 2 years old is between 90 and 120 $\mu\text{g}/\text{day}$ (3). The iodine levels of the mother during pregnancy affect the iodine levels in the baby. This shows that mothers with adequate iodine intake tend to have children with optimal iodine levels (4). Interventions to address iodine deficiency, such as iodine supplementation during pregnancy, have shown potential in enhancing psychomotor development in children. Evidence shows that iodine supplementation can improve gross motor skills in children living in highland areas experiencing iodine deficiency (2).

Magelang Regency is geographically a highland area, and an iodine deficient area. Based on the survey of iodine adequacy in the pregnant women population, it shows that the iodine needs of pregnant women are not guaranteed to be sufficient daily (5). Several factors that need to be considered besides the geographical conditions of the environment include family characteristics, the nutritional status of the child, and the mother's parenting style, which can influence the child's development. Issues such as gender, maternal education, maternal knowledge, and overall nutrition play an important role in the improvement of development (4). This study aims to analyse the factors that influence motor development in children under two years old in rural areas with

iodine deficiency.

Materials and Methods

Data source

46 respondents participated in a cross-sectional study with iodine deficiency in Magelang Regency Central Java, Indonesia. To maintain data quality, the team's perception equation was carried out on questionnaires, editing, coding and tabulation, data cleaning, and data analysis. The collection of independent variable data regarding respondent characteristics was conducted through interviews using a standardized questionnaire, while the measurement of children under two developments used the Bayley Scale.

Dependent and independent variables

Motoric development is the dependent variable, while the variables gender, age, wasting, underweight, stunted, parenting, knowledge, education and mother's occupation are the independent variables.

Data analysis

In the initial stage of sampling, the research used the Chi-Square test to analyse bivariate comparisons. Binary logistic regression was used in the last stage. Previous tests to analyse the multivariate relationship between all independent factors and shopping behaviour and stunting was also used. Next, the IBM SPSS 21 application was used during the statistical analysis stage of the analysis.

Ethical clearance

With Number: 323/EA/KEPK/-FKM/2024, the health research ethics commission of Diponegoro University's Faculty of Public Health has approved this study, which was conducted in compliance with research standards, and has obtained approval from respondents in the form of signing a letter of consent (informed consent).

Results

The bivariate analysis between the independent and dependent variables was displayed in table 1. The table shows that several variables have a significant relationship with motor development, namely gender, toddlers who are underweight, and stunted toddlers with a p-value <0.05 , while other variables do not

Table 1. Results of bivariate analysis of independent variables on motor development variable

Variable	Motorik development				p-value
	Delay		Normal		
	N	%	N	%	
Gender of child					
Female	3	15.8	16	84.2	0.031
Male	10	37.0	17	63.0	
Age child					
<12 months	6	33.3	12	66.7	0.540
>/= 12 months	7	25.0	21	75.0	
Mother's knowledge					
Less	8	25.8	23	74.2	0.595
Good	5	33.3	10	66.7	
Mother's education					
Elementary school	6	27.3	16	72.7	0.940
Junior high school	5	31.3	11	68.8	
Senior high school	2	25.0	6	75.0	
Mother's employment status					
Working	1	50.0	1	50.0	0.485
Not working	12	27.3	32	72.7	
Wasting					
Yes	2	66.7	1	33.3	0.127
No	11	25.6	32	74.4	
Underweight					
Yes	4	80.0	1	20.0	0.006
No	9	22.0	32	78.0	
Stunted					
Yes	6	46.2	7	53.8	0.019
No	7	21.2	26	78.8	
Mother's parenting style					
Authoritative	4	23.5	13	76.5	0.408
Authoritarian	1	11.1	8	88.9	
Indulgent	3	42.9	4	57.1	
Uninvolved	5	38.5	8	61.5	

have a significant relationship.

Table 2 showed the multivariate analysis of the three significant variables from the previous analysis. The table displays how strongly the independent and dependent variables are related to one another. Compared to children who are not underweight, underweight children under two are 14.222 times more likely to experience delays in their motor development. Stunted children under two are 16,915

times more likely to face delays in their motor development than non-stunted children.

Discussion

The association between gender and the motor development of children under two years old is displayed in table 1. With a p-value <0.05, the table indicates a substantial correlation between toddlers' motor development and gender. This is consistent

Table 2. Results of multivariate analysis of independent variables on motor development

Variable	Motorik development			
	p-value	AOR	95%CI	
			Lower	Upper
Gender of child				
Female	0.084	0.225	0.041	1.220
Male	-	-	Ref	
Underweight				
Yes	0.024	14.222	1.408	14.672
No	-	-	Ref	
Stunted				
Yes	0.032	16.915	1.273	22.687
No	-	-	Ref	

AOR: Adjusted Odds Ratio.

with several research findings (6-8). This article shows that the proportion of motor development in females is slightly higher compared to males. This is consistent with the results of a study in Bosnia and Herzegovina, which showed that girls achieve better motor development outcomes than boys (9). Some research findings recommend that in future studies, child development stimulation interventions need to consider gender differences.

Table 1 also shows that of children under two years old from mothers with secondary and higher education have better motor development compared to those from mothers with low education. This is consistent with several previous research findings that state that maternal knowledge and education are related to child development (10-13). A high level of maternal education correlates with the knowledge and parenting practices applied to the child. Mother's parenting patterns, when accompanied by sufficient education and knowledge, tend to exhibit good attitudes and practices in toddler care, thereby enhancing toddler development.

Based on the mother's employment status, mothers who do not work have a higher proportion of children with normal motor development compared to those with developmental disorders. Mothers who do not have work commitments will have more time for their children, allowing for a more intensive parenting approach. This is consistent with other research that

shows that children of working mothers experience smaller improvements compared to children of non-working mothers (10).

Study showed that the proportion of children under two who are underweight almost all experience motor development disorders. Meanwhile, further analysis using logistic regression showed that children under two who are underweight are 14.222 times more likely than those who are not to experience delays in their motor development. These findings highlight the importance of improving the nutrition of toddlers to enhance child development (14,15). In addition to good nutrition, proper caregiving will result in optimal development. Additional study demonstrates the significance of initiatives to enhance toddlers' nutritional health and facilitate effective parenting for kids under two (16).

Additionally, table 2 demonstrates that children under two who suffer from stunting are 16.915 times more likely to encounter delays in their motor development than those who do not. Children with stunting experience growth failure, which can also interfere with their language, social, and personal development, as well as their fine and gross motor skills (8,17). According to other studies, children who are stunted between the ages of one and three are more likely than their non-stunted counterparts to experience developmental delays. Several studies also state that stunting is closely related to delays in motor development, language development, and personal-social development in children (18).

The development of children under two is related to parenting styles and developmental stimulation provided by mothers or caregivers (19). This article shows that the mother's parenting style is almost evenly distributed across four categories of parenting styles. Each parenting style will shape the child's character in the future. A mother's good behaviour regarding knowledge, attitudes, and practices will determine the parenting style adopted. The style and stimulation of a child's development can optimally shape both their motor and mental development (20). With appropriate developmental stimulation, the risk of developmental delays is reduced, and it enhances motor development, language development, and the child's personal and social development (6,21).

Strengths and limitations

This study aims to see how the characteristics of toddlers in iodine-deficient areas relate to motor development. On the other hand, this study has limitations, namely using a minimum sample size setting so that the analysis is less than optimal. Research with a larger sample may provide better results.

Conclusion

Factors that influence the motor development of children under two years of age in areas experiencing iodine deficiency are gender, underweight, and stunting. Underweight children under two are 14.222 times more likely than non-underweight children to experience motor development delays, while stunted children under two are 16.915 times more likely than

non-stunted children.

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Conflict of Interest

All authors declare no conflicts of interest.

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