Association of Stunted in Early Life and Low Child Development Outcomes: A Retrospective Cohort Study

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Keywords: Development Outcome, Early Years, Linear Growth Failure.

Abstract: Many studies have shown that stunting is associated with low development outcomes. However, study on a low social economy outcome is still rare. This retrospective cohort study aimed to determine the role of stunted in early life on child developmental outcomes at 49 to 79 months old. This study analyzed data from Bogor Longitudinal Study of Child Growth and Development (BLSCGD). Subjects were divided based on the main exposure, namely severe Linear Growth Failure (LGF) at 0-12 months. Seventy exposed and sixty-nine non-exposed groups were randomly selected. The primary outcome in this analysis is the development outcome at 49-79 months old as measured by the *Kuesioner Pra Skrining Perkembangan (KPSP)*. The main predictor is experiencing stunting at an early age (0-24 months). Multivariate analysis was done with a logistic regression test. This study showed that children that never stunted in their early years have higher developmental scores at 49 to 79 months old (8.4 ± 1.3 SD) than children that ever been stunted (8.1 ± 1.5 SD) in the early years. Multivariate analysis showed that experience stunted in the early years is a risk factor of child low developmental outcomes at 49 to 79 months old, even though statistically not significant. Maintaining good nutrition as indicated by optimal nutritional status in the early years has been found to be one of the important factors that influence child development outcomes. Thus, many aspects should be prioritized to achieve optimal health and nutrition in the early years.

1 INTRODUCTION

A study that published by Lancet in 2007 has estimated that 219 million children globally continue to face many risks such as poverty, malnutrition, and other risks that lead to suboptimal developmental outcomes (Lu et al., 2016). Early child development will form the foundation of adult health and well-being (Lu et al., 2016). Children in developing countries who fail to achieve their developmental potential are tend to have average deficit annual income, that result from deficits in schooling (Lu et al., 2016).

Stunting is the manifestation of chronic nutritional disorders and has been used as indicators for assessing compromised developmental progress. National data showed that linear growth retardation occur even when the child is born, with low birth weight and length, which might lead increase stunting prevalence in later age (Badan Penelitian dan Pengembangan Kesehatan, 2019). The prevalence of under five children that stunted has been decreased in the last decade, but in 2022 there are 21.6% of under five children in Indonesia that stunted, which means that stunted still become important public health problem need to be solved (Kementerian Kesehatan Republik Indonesia, 2023).

Stunting has been studied and proposed as one of the causes of child low developmental outcomes. Especially, if it occurs during the early years, whereas the brain development reaches its peak. Three main pathways mentioned on which poor nutrition may affect developmental outcomes among children. First, nutritional deficiency can cause structural and functional damage to the brain, second, children that lack of energy tend to withdraw and engage less with their environment, which will effect on how they learn, and third, caregivers have treat them differently so that it challenges them less (Adawiyah, R. Asyifa & Azijah, 2020).

Many studies have been conducted to investigate association between stunted and child development outcomes, however, there is a limited number of studies that employ a longitudinal design, particularly those conducted in developing countries, such as Indonesia. Thus, we conducted this study to

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investigate the role of stunted in early years to child developmental outcome at 49 to 79 months old.

2 METHODS

This study analyzed data from Bogor Longitudinal Study of Child Growth and Development (BLSCGD). Subjects were divided based on the main exposure, namely severe Linear Growth Failure (LGF) at 0-12 months. Seventy exposed and sixty-eight non-exposed groups were randomly selected. The primary outcome in this analysis is development outcome at 49-79 months old.

The instrument used to measure children's development is the KPSP which is part of the implementation of the Stimulation, Detection, and Early Intervention of Growth and Development (SDIDTK) program from the Ministry of Health. KPSP measures the development of gross and fine motor, communication and language as well as social personal which is adapted from Denver Prescreening Developmental Questionnaires. In this study, the KPSP form was used for age 48 to 72 months. KPSP consists of 9-10 developmental questions/tasks based on the existing age level. Point 1 is given if the child can carry out the given developmental task. Children are categorized as having developments that are appropriate to their developmental stages if they have a total score of ≥ 9, and are said to have developments that are doubtful/possible for deviations if they have a score of < 9. (Kemenkes RI, 2019)

Main exposure in this analysis is experience of stunted (LAZ < -2 SD) in the period of 0-24 months (early life). Categorized as 0. Never stunted and 1. Ever stunted. The potential confounders of this analysis are categorized into socio-demographic and other factors. There were six variables under socio-demographic information i.e. child gender, age of a child in cognitive assessment, father and mother education level, and occupation. Father and mother's education level is completed level of education by father and mother, categorized into “Low” (complete education up to junior high school) and “Middle and High” level of education (complete level of education above junior high school/high school or college).

Psychosocial stimulation was assessed with HOME inventory, which consist of 55 questions. Each question is scored 0 or 1. Therefore, the total is 55. Child stimulation and quality of care is categorized into poor (score ≤ 60%), average (score 61%-80%), and good (score ≥ 81%). Exclusive breastfeeding is the history of exclusive breastfeeding practice in 0-5 months.

Interviews were conducted by trained enumerators with a health education background. All of the interviews used pre-tested questionnaires. The analysis was carried out using descriptive analysis, bivariate using chi-square for categorical variables, or one-way ANOVA for continuous variables. Independent sample t-test or Wilcoxon Shapiro-wilk to assess the association between continuous variables with category of respondents (exposed or not exposed). A logistic regression test was used to analyze the effect of experience stunted in early life and other factors on child cognitive development. The statistical analysis was performed using SPSS.

Before conducting the study, the respondents signed informed consent. This research has received ethical approval from the Faculty of Medicine Ethics Commission, Universitas Indonesia.

3 RESULTS

The proportion of boys and girls is slightly different. Most children were at aged 60 – 79 months when the data collection was taken. Around one tenth children were exclusively breastfed. The majority of parents exhibited educational attainment at the middle and high levels. More than half fathers are employed as laborers or other professions. Most of mothers are housewives. Around one third children experience low levels of psychological stimulation. Nearly one third of children have never been exposed to any form of formal/non-formal education.

Table 1: Characteristics of study subjects.

Variables	n (%)
Children	
Gender	
Boy	67 (48.6)
Girl	71 (51.4)
Age at data collection	
47-59 months	50 (36.2)
60-79 months	88 (63.8)
Exclusive breastfeeding	
Yes	15 (10.9)
Parents	
Father education level	
Middle and High	115 (83.3)
Low	23 (16.7)
Mother education level	
Middle and High	114 (82.6)
Low	24 (17.4)
Father occupation	
Civil servant	3 (2.2)
Private employee	29 (20.9)
Enterprenuer	18 (12.9)

Laborer/other job	89 (64.0)
Mother occupation	
Housewife	111 (79.9)
Working mom	28 (20.1)
Psychosocial stimulation	
Good and average	89 (64.5)
Poor	49 (35.5)
Received formal/informal education	
Received education ≥ 12 months	20 (14.5)
Received education 1-11 months	80 (58.0)
Never received education	38 (27.5)

Table 2 shows that subjects that ever stunted in early life have lower development scores than subjects that never being stunted. Similarly, as subjects that were stunted at data collection have lower scores than normal children, even though not statistically significant.

Table 2: Analysis of child development scores (mean±SD) by Stunted experience.

Variables	n	Child development score	
		Mean	SD
Experience of stunted in early life			
Never stunted	68	8.4	1.3
Ever stunted	78	8.1	1.5
p-value		0.169	
Stunted at data collection			
No	109	8.2	1.4
Yes	12	8.1	1.2
p-value		0.438	

Having been stunted in early life was found as a risk factor for low child development outcomes an OR of 1.59 (0.65-3.92 95% CI) although it was not statistically significant. The results also show that stunted at data collection have higher OR whereas stunted children at cognitive assessment have an OR of 3.86 (0.85-17.45 95% CI) compared with normal children. Other factors that significantly associated with low child development outcomes are children aged 60-79 months at data collection had an odd of 0.11 times (0.04-0.28 95% CI) or become a protective factor to have low-child development outcome.

Table 3: Association of stunted experience with low child development outcome.

Variables	OR (95% CI) crude	p-value	OR (95%CI) adjusted	p-value
Experienced stunted in early life	1.50 (0.59-3.83)	0.388	1.59 (0.65-3.92)	0.307
Stunted at data collection	4.08 (0.86-19.48)	0.078	3.86 (0.85-17.45)	0.079
Girls	0.37 (0.13-1.06)	0.065	0.45 (0.19-1.08)	0.075
Childs aged 60-79 months	0.13 (0.05-0.38)	0.000	0.11 (0.04-0.28)	0.000*
Not exclusive breastfed	0.88 (0.21-3.63)	0.858	--	
Low father education	1.16 (0.32-4.20)	0.818	-	
Low mother education	1.95 (0.60-6.33)	0.264	-	
Father occupation				
Civil servant				
Private employee	0.66 (0.02-23.96)	0.822	0.74 (0.02-22.46)	0.863
Enterprenuer	0.65 (0.01-28.36)	0.825	0.83 (0.02-28.92)	0.922
Laborer/other job	0.42 (0.01-14.77)	0.633	0.60 (0.02-17.03)	0.768
Working mothers	0.88 (0.27-2.74)	0.809	-	
Poor Psychosocial stimulation	2.03 (0.81-5.12)	0.132	2.02 (0.83-4.93)	0.122
Received formal/informal education				
Received education ≥ 12 months			-	
Received education 1-11 months	0.67 (0.17-2.67)	0.567	-	
Never received education	1.07 (0.21-5.45)	0.938	-	

4 DISCUSSION

This study reveals that having been stunted in early life (0-24 months) is a risk factor for low child development outcomes (gross and fine motoric skills, communication and language, and social personal) among children 49-79 months old. It shows there is a long-term effect of nutritional deprivation on child development in later life.

The first two years after birth are a critical period for a child's brain development. During this period, if the children do not fulfil with nutrition, apical dendrites will shorten in the brain. This will causes a decrease in brain function, which then effects on movement skills, attention, memory, and cognitive abilities (De Onis & Branca, 2016). Moreover, nutritional deficiencies from prenatal to early childhood mass can cause neurological disorders and brain development disorders that affect **cognitive and language abilities.** This will limit the vocabulary and low level of intelligence of the children with a history of stunting in early childhood (Prado & Dewey, 2014). Nevertheless, findings from a study conducted on animals and humans have shown that the chronicity, timing, and severity of nutritional deficiencies have an effect on brain development that will have an impact on subsequent developmental abilities (Black, 2018).

The results also supported by a study that examining the relationship between stunting at age 2 and ability at age 4 shows there is significant association between stunting with the Revised-Denver Pre-screening Developmental Questionnaires (R-DPDQ) scores while association with children's performance on the Vineland Social Maturity Scale (VSMS), was not found. Furthermore, children with low height-for-age at 2 years are worse on measures capturing higher-order fine motor skills and cognitive functioning but do not fall behind in terms of daily living skills or social maturity (Casale et al., 2014).

However, another study found that stunting tends to affect personal development and children's ability to socialize. Stunted children usually look apathetic and ignorant to play with other people and these will potentially will be carried to the later age (Setianingsih et al., 2020). Furthermore, a study in Mexico found a significant correlation between lower length-for-age z-scores (LAZ) and stunting with decreased levels of physical activity and reduced exploration among the children. Children with stunted growth exhibited distinct behavioural variations, such as apathy, heightened negative affect, and diminished levels of activity, playfulness, and exploration (Aburto et al., 2009). Therefore, stunted children which affecting the maturity of nerve cells can also result in children's social abilities. A study in a province in Indonesia, East Nusa Tenggara showed that short school children had lower self-confidence (C. Scheffler et al., 2020; Christiane Scheffler et al., 2021).

Research conducted in the Narahenpita area, Colombo also found that among children aged 36-54 months, gross motor skills, and fine motor skills in stunting children were lower than in normal children (Solihin et al., 2013). This result also found in a city in Indonesia, North Padang, that children who were stunted had a greater risk of experiencing delays in motor development, both gross and fine motor (Komaini & Mardela, 2018).

One explanation stated that if the muscle mechanism has not developed properly, motor movement will not be perfect. This eventuality occurs in children with stunted development abnormalities, hence will develop at a slower rate, and there can be no coordinated voluntary action before the child is in normal condition (Komaini & Mardela, 2018).

Decreased motor function of stunting children without congenital errors is related to the low mechanical ability of the triceps muscle due to the slow maturation of muscle function (Solihin et al., 2013). Gross motor skills encompass bodily movements that engage the major muscle groups located in the arms, legs, torso, and feet. Skeletal muscle in humans is predominantly specifically in the arms and legs, thus it is plausible to assert that leg lengths may play a role in influencing muscle mass. Moreover, stunted children have been observed to exhibit a decrease in muscle mass as a result of diminished limb length (Pomeroy et al., 2012). Besides that, the potential cause of the poor motor skills observed in the stunted children could be attributed to a decrease in muscle mass (Nahar et al., 2020).

Moreover, this study also found that current stunted status has more effect on low child development outcomes. It emphasizes findings by many studies before, one of which stated children who are stunted have an 11.98 times greater chance of having below-average motor development (Pantaleon et al., 2016). This might be due to stunted at previous age that has not recovered or recurred whose impact has carried over to the present.

Study also revealed that age over 60 months was found to be a protective factor for low IQ. This may be because older children have received more stimulation either from the environment or from formal/non-formal education so they can do developmental tasks better.

5 CONCLUSIONS

Study emphasizes the long-term effect of nutritional deprivation shown by the experience of stunted during early life with low child development outcomes at 49 - 79 months. Furthermore, children that are still stunted at 49 – 79 months have a bigger risk of having low development outcomes. Thus, efforts to deal with stunting must continue to be carried out, especially with multi-sectoral steps and an emphasis on efforts to manage local resources

REFERENCES

Aburto, N. J., Ramirez-Zea, M., Neufeld, L. M., & Flores-Ayala, R. (2009). Some indicators of nutritional status are associated with activity and exploration in infants at risk for vitamin and mineral deficiencies. *Journal of Nutrition*, *139*(9), 1751–1757. https://doi.org/10.3945/jn.108.100487

Adawiyah, R. Asyifa & Azijah, I. (2020). Nutritional Status, Development Level, and Psychosocial Function of Preschool Children. *Journal of Health Education*, *25*(5 (1)), 21–28.

Badan Penelitian dan Pengembangan Kesehatan. (2019). *Laporan Nasional Riskesdas 2018*. Lembaga Penerbit Badan Penelitian dan Pengembangan Kesehatan.

Black, M. M. (2018). Impact of nutrition on growth, brain, and cognition. *Nestle Nutrition Institute Workshop Series*, *89*, 185–195. https://doi.org/10.1159/000486502

Casale, D., Desmond, C., & Richter, L. (2014). The association between stunting and psychosocial development among preschool children: A study using the South African Birth to Twenty cohort data. *Child: Care, Health and Development*, *40*(6), 900–910. https://doi.org/10.1111/cch.12143

De Onis, M., & Branca, F. (2016). *Childhood stunting: a global perspective*. https://doi.org/10.1111/mcn.12231

Kemenkes RI. (2019). Pedoman SDIDTK dI Pelayanan Dasar. In *Pedoman Pelaksanaan Stimullasi, Deteksi dan Intervensi Dini Tumbuh Kembang Anak di Tingkat Pelayanan Kesehatan Dasar* (p. 138). file:///C:/Users/Acer/Downloads/Pedoman SDIDTK DI PUSKESMAS 2019.pdf

Kementerian Kesehatan Republik Indonesia. (2023). Buku Saku : Hasil Survei Status Gizi Indonesia (SSGI) 2022. *Kementerian Kesehatan Republik Indonesia*, 1–7.

Komaini, A., & Mardela, R. (2018). Differences of Fundamental Motor Skills Stunting and Non Stunting Preschool Children in Kindergarten in North Padang. *IOP Conference Series: Materials Science and Engineering*, *335*(1). https://doi.org/10.1088/1757-899X/335/1/012131

Lu, C., Black, M. M., & Richter, L. M. (2016). Risk of poor development in young children in low-income and middle-income countries: an estimation and analysis at the global, regional, and country level. *The Lancet Global Health*, *4*(12), e916–e922. https://doi.org/10.1016/S2214-109X(16)30266-2

Nahar, B., Hossain, M., Mahfuz, M., Islam, M. M., Hossain, M. I., Murray-Kolb, L. E., Seidman, J. C., & Ahmed, T. (2020). Early childhood development and stunting: Findings from the MAL-ED birth cohort study in Bangladesh. *Maternal and Child Nutrition*, *16*(1). https://doi.org/10.1111/mcn.12864

Pantaleon, M. G., Hadi, H., & Gamayanti, I. L. (2016). Stunting berhubungan dengan perkembangan motorik anak di Kecamatan Sedayu, Bantul, Yogyakarta. *Jurnal Gizi Dan Dietetik Indonesia (Indonesian Journal of Nutrition and Dietetics)*, *3*(1), 10. https://doi.org/10.21927/ijnd.2015.3(1).10-21

Pomeroy, E., Stock, J. T., Stanojevic, S., Miranda, J. J., Cole, T. J., & Wells, J. C. K. (2012). Trade-Offs in Relative Limb Length among Peruvian Children: Extending the Thrifty Phenotype Hypothesis to Limb Proportions. *PLoS ONE*, *7*(12). https://doi.org/10.1371/journal.pone.0051795

Prado, E. L., & Dewey, K. G. (2014). Nutrition and brain development in early life. *Nutrition Reviews*, *72*(4), 267–284. https://doi.org/10.1111/nure.12102

Scheffler, C., Hermanussen, M., Bogin, B., Liana, D. S., Taolin, F., Cempaka, P. M. V. P., Irawan, M., Ibbibah, L. F., Mappapa, N. K., Payong, M. K. E., Homalessy, A. V., Takalapeta, A., Apriyanti, S., Manoeroe, M. G., Dupe, F. R., Ratri, R. R. K., Touw, S. Y., K, P. V., Murtani, B. J., … Pulungan, A. (2020). Stunting is not a synonym of malnutrition. *European Journal of Clinical Nutrition*, *74*(3), 377–386. https://doi.org/10.1038/s41430-019-0439-4

Scheffler, Christiane, Hermanussen, M., Soegianto, S. D. P., Homalessy, A. V., Touw, S. Y., Angi, S. I., Ariyani, Q. S., Suryanto, T., Matulessy, G. K. I., Fransiskus, T., Safira, A. V. C., Puteri, M. N., Rahmani, R., Ndaparoka, D. N., Payong, M. K. E., Indrajati, Y. D., Purba, R. K. H., Manubulu, R. M., Julia, M., & Pulungan, A. B. (2021). Stunting as a Synonym of Social Disadvantage and Poor Parental Education. *International Journal of Environmental Research and Public Health*, *18*(3), 1350. https://doi.org/10.3390/ijerph18031350

Setianingsih, Permatasari, D., Sawitri, E., & Ratnadilah, D. (2020). *Impact of Stunting on Development of Children Aged 12–60 Months*. *27*(ICoSHEET 2019), 186–189. https://doi.org/10.2991/ahsr.k.200723.047

Solihin, R. D. M., Anwar, F., & Sukandar, D. (2013). Motorik Pada Anak Usia Prasekolah (Relationship Between Nutritional Status, Cognitive Development, and Motor Development in Preschool Children). *Penelitian Gizi Dan Makanan*, *36*(1), 62–72.

Aburto, N. J., Ramirez-Zea, M., Neufeld, L. M., & Flores-Ayala, R. (2009). Some indicators of nutritional status are associated with activity and exploration in infants at risk for vitamin and mineral deficiencies. *Journal of Nutrition*, *139*(9), 1751–1757. https://doi.org/10.3945/jn.108.100487

Adawiyah, R. Asyifa & Azijah, I. (2020). Nutritional Status, Development Level, and Psychosocial Function of Preschool Children. *Journal of Health Education*, *25*(5 (1)), 21–28.

Badan Penelitian dan Pengembangan Kesehatan. (2019). *Laporan Nasional Riskesdas 2018*. Lembaga Penerbit Badan Penelitian dan Pengembangan Kesehatan.

Black, M. M. (2018). Impact of nutrition on growth, brain, and cognition. *Nestle Nutrition Institute Workshop Series*, *89*, 185–195. https://doi.org/10.1159/000486502

Casale, D., Desmond, C., & Richter, L. (2014). The association between stunting and psychosocial development among preschool children: A study using the South African Birth to Twenty cohort data. *Child: Care, Health and Development*, *40*(6), 900–910. https://doi.org/10.1111/cch.12143

De Onis, M., & Branca, F. (2016). *Childhood stunting: a global perspective*. https://doi.org/10.1111/mcn.12231

Kemenkes RI. (2019). Pedoman SDIDTK dI Pelayanan Dasar. In *Pedoman Pelaksanaan Stimullasi, Deteksi dan Intervensi Dini Tumbuh Kembang Anak di Tingkat Pelayanan Kesehatan Dasar* (p. 138). file:///C:/Users/Acer/Downloads/Pedoman SDIDTK DI PUSKESMAS 2019.pdf

Kementerian Kesehatan Republik Indonesia. (2023). Buku Saku : Hasil Survei Status Gizi Indonesia (SSGI) 2022. *Kementerian Kesehatan Republik Indonesia*, 1–7.

Komaini, A., & Mardela, R. (2018). Differences of Fundamental Motor Skills Stunting and Non Stunting Preschool Children in Kindergarten in North Padang. *IOP Conference Series: Materials Science and Engineering*, *335*(1). https://doi.org/10.1088/1757-899X/335/1/012131

Lu, C., Black, M. M., & Richter, L. M. (2016). Risk of poor development in young children in low-income and middle-income countries: an estimation and analysis at the global, regional, and country level. *The Lancet Global Health*, *4*(12), e916–e922. https://doi.org/10.1016/S2214-109X(16)30266-2

Nahar, B., Hossain, M., Mahfuz, M., Islam, M. M., Hossain, M. I., Murray-Kolb, L. E., Seidman, J. C., & Ahmed, T. (2020). Early childhood development and stunting: Findings from the MAL-ED birth cohort study in Bangladesh. *Maternal and Child Nutrition*, *16*(1). https://doi.org/10.1111/mcn.12864

Pantaleon, M. G., Hadi, H., & Gamayanti, I. L. (2016). Stunting berhubungan dengan perkembangan motorik anak di Kecamatan Sedayu, Bantul, Yogyakarta. *Jurnal Gizi Dan Dietetik Indonesia (Indonesian Journal of Nutrition and Dietetics)*, *3*(1), 10. https://doi.org/10.21927/ijnd.2015.3(1).10-21

Pomeroy, E., Stock, J. T., Stanojevic, S., Miranda, J. J., Cole, T. J., & Wells, J. C. K. (2012). Trade-Offs in Relative Limb Length among Peruvian Children: Extending the Thrifty Phenotype Hypothesis to Limb Proportions. *PLoS ONE*, *7*(12). https://doi.org/10.1371/journal.pone.0051795

Prado, E. L., & Dewey, K. G. (2014). Nutrition and brain development in early life. *Nutrition Reviews*, *72*(4), 267–284. https://doi.org/10.1111/nure.12102

Scheffler, C., Hermanussen, M., Bogin, B., Liana, D. S., Taolin, F., Cempaka, P. M. V. P., Irawan, M., Ibbibah, L. F., Mappapa, N. K., Payong, M. K. E., Homalessy, A. V., Takalapeta, A., Apriyanti, S., Manoeroe, M. G., Dupe, F. R., Ratri, R. R. K., Touw, S. Y., K, P. V., Murtani, B. J., … Pulungan, A. (2020). Stunting is not a synonym of malnutrition. *European Journal of Clinical Nutrition*, *74*(3), 377–386. https://doi.org/10.1038/s41430-019-0439-4

Scheffler, Christiane, Hermanussen, M., Soegianto, S. D. P., Homalessy, A. V., Touw, S. Y., Angi, S. I., Ariyani, Q. S., Suryanto, T., Matulessy, G. K. I., Fransiskus, T., Safira, A. V. C., Puteri, M. N., Rahmani, R., Ndaparoka, D. N., Payong, M. K. E., Indrajati, Y. D., Purba, R. K. H., Manubulu, R. M., Julia, M., & Pulungan, A. B. (2021). Stunting as a Synonym of Social Disadvantage and Poor Parental Education. *International Journal of Environmental Research and Public Health*, *18*(3), 1350. https://doi.org/10.3390/ijerph18031350

Setianingsih, Permatasari, D., Sawitri, E., & Ratnadilah, D. (2020). *Impact of Stunting on Development of Children Aged 12–60 Months*. *27*(ICoSHEET 2019), 186–189. https://doi.org/10.2991/ahsr.k.200723.047

Solihin, R. D. M., Anwar, F., & Sukandar, D. (2013). Motorik Pada Anak Usia Prasekolah (Relationship Between Nutritional Status, Cognitive Development, and Motor Development in Preschool Children). *Penelitian Gizi Dan Makanan*, *36*(1), 62–72.