

# Impact of Infancy Conditions on Physical Growth of Children Under-five

Claudia Azhari<sup>1</sup>, Yeni Mahwati\*<sup>1</sup>, Yeni Suryamah<sup>2</sup>, Arfian Hikmat Ramdan<sup>1</sup>

<sup>1</sup>Sekolah Tinggi Ilmu Kesehatan Dharma Husada, Jl. Terusan Jakarta No.75 Antapani, Bandung, Jawa Barat, 40282, Indonesia

<sup>2</sup>Kantor Kesehatan Pelabuhan, Jl. Cikapayang No. 05 Tamansari, Bandung, Jawa Barat, 40116, Indonesia

\*Authors correspondence, Email address: ymahwati@gmail.com

ARTICLE INFO	ABSTRACT
<b>ORCHID ID</b> Author 1:- Author 2: <a href="https://orcid.org/0000-0002-6567-9486">https://orcid.org/0000-0002-6567-9486</a> Author 3:- Author 4:- <a href="https://orcid.org/0009-0007-9915-8850">https://orcid.org/0009-0007-9915-8850</a>	Children under five years old is the age group most vulnerable to several health problems. It is important to evaluate the impact of infancy condition on their physical growth. This research aimed to examine the impact of infancy condition on the physical growth of children under-five years old. The unmatched case-control study was conducted in Puskesmas Griya Antapani areas, Bandung from May to July, 2023. A total of 112 children aged under 5 years were included in this study (56 cases and 56 control). The analysis used multivariate logistic regression to determine adjusted odds ratios (OR). The results showed that the variables associated with the children growth are infection or illness in infancy (OR is 0,138 95 percent CI 0,51 until 0,375), feeding patterns in infancy (OR is 11,000 95 percent CI 4,566 until 26,503), birth weight (OR is 0,170 95 percent CI 0,036 until 0,818) and economic status (OR is 0,062 95 percent CI 0,14 until 0,280). Multivariate logistic regression showed that economic status was the most dominant factor for children physical growth (OR is 6.701 95 percent CI 1,323 until 33,944). Education for families is needed in choosing food that is rich in nutrition and economical by utilizing alternative sources of protein, the amount of food, and the schedule of meals according to the needs of children according to their age.
<b>Article History:</b> Paper received:22-11-2023 revised:31-12-2023 accepted:13-02-2024	
<b>Keywords:</b> infancy condition; physical growth; children under-five years old.	

## 1. Introduction

Children under five years old is the age group most vulnerable to several health problems. Stunted and severely stunted are the condition of nutritional status based on the index of body length for age (PB/U) or height for age (TB/U) compared to the WHOMGRS (Multicentre Growth Reference Study) standard with a limit (Zscore) of less than -2 SD.(Alfiah & Setiyabudi, 2020). According to the World Health Organization (WHO), globally, approximately 22% of children under the age of 5 are too short for their age in 2020 (WHO, n.d.). Meanwhile, in Indonesia, 2019, the prevalence of stunted and severely stunted was 27.67% (Kemenkes RI, 2021).

In that period, the monitoring must be carried out regularly and continuously. Early detection of developmental deviations in children is a major global theme in modern child health services (Yunita & Surayana, 2021). This is because growth must be fulfilled so that it cannot lead to some serious impacts, for example failing in physical growth and inappropriate development that makes toddlers short and very short.

Several previous studies have shown that there is an association between birth length, birth weight, exclusive breastfeeding and the incidence of stunting (Azriful et al., 2018; Roesardhyati & Kurniawan, 2021). Good care in infancy is also an important factor, as adequate developmental stimulation, sensitive care, and proper management of infections can help reduce the risk of stunted and severely stunted in children (Kartinawati et al., 2022; Schoenbuchner et al., 2019). Similar studies have also shown that there is an association between birth spacing, economic status and feeding parenting (Azriful et al., 2018; Modjo et al., 2023)

According to Health Minister Regulation No. 25 of 2014, infants are children aged 0 to 11 months. Infancy is the period after the prenatal period ends and the period before early childhood and is a golden period as well as a critical period of a person's development (Sa'diyah, 2019). It is said to be a critical period because at this time the baby is particularly vulnerable to the environment and is said to be a golden period because the infancy period lasts very short and cannot be repeated (Merita, 2019). Every baby goes through stages of growth and development in its lifetime. Growth and development is a continuous process, and growth is part of the development process (Merita, 2019). Infants and children will gradually develop, and the success of one stage of development will be a prerequisite for the development of the next stage. For this reason, parents must prepare themselves to understand the stages of infant development, so they can anticipate the occurrence of infant developmental disorders during the monitoring and coaching process (Riyanti & Hanifah, 2014).

While the issue of stunted has become a global concern for improving child health, there is limited research focusing on the the impact of infancy condition on the physical growth of under-five children. By understanding the importance of infancy in child development and looking at the factors that affect infancy, so an appropriate action can be taken to strategically prevent or reduce the incidence of stunted and severaly stunted. The aim of this research was to examine the impact of infancy condition on the physical growth of children under-five years old.

## **2. Method**

The Research is conducted from May to July 2023. The population in this study were children aged 12 to 59 month who were located in the region of Griya Antapani Primary Health Care, Bandung, Indonesia. It is used simple random sampling. A total of 112 children aged under 5 years old were included in this research (56 stunted as case group and 56 non- stunted as a control group). The inclusion criteria are: 1) children aged from 12 to 59 months who diagnosed stunted in Primary Health Care 2) have a child identity card book, and 4) parents are willing to sign an informed consent to participate in the study, and 56 non-stunted children as a control group with inclusion criteria: 1) children aged 12-59 months who were not diagnosed stunted in Primary Health Care, 2) have a child's identity card book, and 4) parents are willing to sign informed consent to participate in this study. Physical growth was measured by nutritional status based on an index of body length for age (PB/U) or height for age (TB/U) compared to the WHOMGRS (Multicentre Growth Reference Study) standard with a Zscore of less than -2 SD and divide into two categories stunted vs non-stunted (Alfiah & Setiyabudi, 2020). The ethical clearance of this study was approved and issued by the Health Research Ethics Committee, Sekolah Tinggi Ilmu Kesehatan Dharma Husada.

Data collection was carried out by visiting and conducting interviews to the mothers one by one who have signed the informed consent. Physical growth data was obtained from data on the month of weighing toddlers nutritional status of under-five children at Griya Antapani Primary Health Care and child identity card book. The questionnaire contains the data on the characteristics of participants including history of exclusively breastfeeding, infections or illnesses during infancy, infancy feeding pattern, birth weight, economic status and mother's education level. History of exclusively breastfeeding was divided into two categories; {exclusively breastfed without the addition of other liquids such as formula, water, honey and or other additional foods until the baby reaches 6 months of age vs no exclusively breastfed}. Infections or illnesses during infancy was measured by the history of any infectious diseases e.g. diarrhea when they are 0-11 months old, and then divided into two categorized (less than two vs two or more). Infancy feeding pattern was measured by the actions taken by parents in fulfilling nutrition from food consumed by children according to their age based on the type of food consumed, the amount of food consumed, and the child's meal schedule which divided into two categories (adequate vs inadequate). Birth weight was categorized into two categories (2500 gr and more vs less than 2500 gr). Economic status was measured by the response of the question about sufficiency of family living conditions when children are 0-11 months old and then divided into two categories (high vs low). Mother's education level was categorized into: high educational level (senior high school and college) vs low educational level (primary and junior high school).

The main characteristics of the sample were investigated through descriptive analysis and was followed by bivariate analysis using chi-square test to identify the variables significantly associated with children physical growth. The variables found significant in the bivariate analysis at the  $p < 0.25$  level were entered into multivariate analysis. Logistic regression analyses were conducted to estimate odds ratios (ORs) and 95% confidence intervals (CIs) of physical growth associated with infancy condition factors. Data were analyzed using the SPSS software for Windows.

### 3. Result and Discussion

#### 3.1 Infancy Condition

Table 1 showed the distribution of infancy condition in case and control group. Almost all risk conditions during infancy were higher in the case group compared to the control group. Those who were not exclusively breastfed (53.6%), who have infection or illness during infancy (89.3%), who have inadequate feeding (78.6%), and who have low birth weight were more highly in case group than control group (17.9%). The proportion of low economic status was more highly in the case group (37.5%) compared to the control group (3.6%). The level of maternal education in each group was predominantly in the high category.

Tabel 1. The Distribution of Infancy Condition in Case and Control Group

Infancy Condition	Case Group		Control Group	
	N	%	n	%
<b>Exclusive breastfeeding</b>				
No	30	53,6	22	39,3
Yes	26	46,4	34	60,7
<b>Infection or illness</b>				
At risk	50	89,3	30	53,6
Not at risk	6	10,7	26	46,4
<b>Feeding patterns</b>				
Not Adequate	44	78,6	14	25,0
Adequate	12	21,4	42	75,0
<b>Birth weight</b>				
≤ 2500 gr	10	17,9	2	3,6
> 2500 gr	46	82,1	54	96,4
<b>Economic status</b>				
Low	21	37,5	2	3,6
High	35	62,5	54	96,4
<b>Mother's education level</b>				
Low (Primary and Junior High School)	15	26,8	12	21,4
High (Senior High School and College)	41	73,2	44	78,6
<b>Total</b>	<b>56</b>	<b>100</b>	<b>56</b>	<b>100</b>

Source: Primary Data, 2023

### 3.2 The Relationship Between Infancy Condition and Physical Growth of Under-Five Children

The chi square test in the Table 2 showed there are significant relationship between infection or illness during infancy, feeding pattern, birth weight, and economic status with physical growth of under-five children.

Table 2. Bivariate Analysis

Infancy Condition	Stunted				<i>p value</i>	OR (95% CI)
	Case		Control			
	N	%	N	%		
<b>Exclusive breastfeeding</b>					0,185	0,561 (0,256-1.188)
No	30	53,6	22	39,3		
Yes (Reff)	26	46,4	34	60,7		
<b>Infection or illness</b>					<0,001**	0,138 (0,51-0,375)
At risk	50	89,3	30	53,6		
Not at risk (Reff)	6	10,7	26	46,4		
<b>Feeding patterns</b>					<0,001**	11,000 (4,566-26,503)
Not Adequate	44	78,6	14	25		
Adequate (Reff)	12	21,4	42	75		
<b>Birth weight</b>					0,032*	0,170 (0,036-0,818)
≤ 2500 gr	10	17,9	2	3,6		
> 2500 gr (Reff)	46	82,1	54	96,4		
<b>Economic status</b>					<0,001**	

Low	21	37,5	2	3,6	0,062 (0,014-
High (Reff)	35	62,5	54	96,4	0,280)
<b>Mother's education level</b>					0,659 0,745 (0,312-
Low (Primary and Junior High School)	15	26,8	12	21,4	1.780)
High (Senior High School and College (Reff)	41	73,2	44	78,6	

Source: Primary Data, 2023

\*significant at 0.05

\*\*significant at 0.001

### 3.3 Impact of Infancy Condition on Physical Growth of Under-Five Children

Table 3 showed the results of the multivariate logistic regression analysis. All five variables (not exclusive breastfeeding, infection or illness in infancy, inadequate feeding patterns, low birth weight and low economic status) were statistically significant with physical growth in Unadjusted model.

In Model 1, infection or illness in infancy, inadequate feeding patterns, low birth weight and low economic status still remain statistically significant with physical growth after adjusted for exclusive breastfeeding. In Model 2, infection or illness in infancy, inadequate feeding patterns, and low economic status still remain statistically significant with physical growth after adjusted for low birth weight.

In Model 3, the final multivariate analysis showed that the variables associated with the physical growth were infection or illness in infancy (OR = 4.170; CI = 1.308-13.297), inadequate feeding (OR = 5.993; CI = 2.242-16.020), and low economic status (OR = 6.701; CI = 1.323-33.944). Economic status was the most dominant factor for children physical growth. Those who have low economic status has a 6.701 times greater risk of being stunted compare to those who have a high economic status.

**Table 3. Multivariable Regression Logistic Analysis**

Indepebdebt variable	Unadjusted	Model 1 <sup>a</sup>	Model 2 <sup>b</sup>	Model 3 <sup>c</sup>
No exclusive breastfeeding	1,252 (0,455-3,444)*	-	-	-
Infections or sickness events in infancy that are at risk	4,047 (1,266-12,934)*	4,170 (1,308-13,297)*	4,229 (1,366-13,090)*	4,170 (1,308-13,297)*
Inadequate feeding pattern	5,996 (2,238-16,064)*	5,993 (2,242-16,020)*	6,592 (2,528-17,192)*	5,993 (2,242-16,020)*
Low birth weight	6,315 (0,991-40,255)**	5,954 (0,964-36,778)**	-	5,954 (0,964-36,778)**
Low economic status	6,323 (1,255-32,629)*	6,701 (1,323-33,944)*	5,721 (1,144-18,613)*	6,701 (1,323-33,944)*

Source: Primary Data, 2023

\*significant at 0.05

\*\*significant at 0.001

<sup>a</sup> adjusted for exclusive breasfeeding

<sup>b</sup> adjusted for exclusive breasfeeding and low birth weight

<sup>c</sup> final model

### **3.4 Infection or illness in infancy and physical growth**

This research found there is a relationship between infection or illness in infancy with the physical growth in under-five children. The children who had experienced infection or illness in infancy had a greater risk than those who did not experience infection or illness in infancy. This finding is in line with another research that found toddlers who often experience infections have a greater risk of experiencing the incidence of short and very short toddlers than toddlers who rarely experience infectious diseases (Maineny et al., 2022; Nurbawena et al., 2021). Infectious diseases can result in the incidence of short and very short toddlers where infectious diseases are caused by bacteria, viruses, fungi, and worms. Infectious diseases are experienced by infants and toddlers because of their vulnerability to disease, infectious diseases themselves can lead to reduced nutritional status of infants and toddlers resulting in decreased appetite and disruption of absorption in the digestive tract.

### **3.5 Feeding patterns and physical growth**

This research found there is a relationship between feeding patterns in infancy with the physical growth in children. The children who had inadequate feeding has a greater risk of experiencing stunted than those who had adequate feeding. This finding is similar with another research that found toddlers with inappropriate feeding patterns have a higher risk of stunting compared to toddlers with appropriate feeding patterns (Derek & Bolang, 2023; Suherman & Nurhaidah, 2020).

The purpose of complementary feeding is to increase the energy and nutrients needed by the baby because breast milk cannot meet the baby's needs continuously. Thus, additional food is given to fill the gap between the total nutritional needs of the child and the amount obtained from breast milk. The timing of complementary feeding before 6 months or more than 6 months can cause the baby lack of nutrients and will experience iron deficiency and experience delayed growth and development. The type of food consumption determines the nutritional status of a child, a good quality of food if the daily menu provides a nutritious, balanced and varied menu composition according to their needs. Feeding patterns of stunted and severely stunted are deemed necessary for nutritional consultation and assistance. Some toddlers are accustomed to consuming only rice and vegetable soup, then there are toddlers who only like to eat porridge for reasons of difficulty eating even up to the age of more than 2 years, as well as less varied food processing from toddler mothers who prefer to buy more practical food (Purwani et al., 2013).

### **3.6 Economic status and physical growth**

This research found a relationship between low economic status and children's physical growth. The children with low economic status have a greater risk of stunting compared to children with high economic status. This finding is in line with another research that conducted in Malang Regency and North Maluku. The families with low income have a greater chance to having stunted toddlers compared to families with high income (Islami & Khourah, 2021; Ramli et al., 2009)

Economic status was the most dominant factor for children physical growth. It has a very important role in the stunted and severely stunted. The level of economic status is related to

the family's purchasing capability. The family's ability to buy food depends on the size of their income, the price of the food, and the level of management of land and yard resources.

Income is influenced the family purchasing capability. Increasing income will rise the opportunity to buy food with better quality and quantity and vice versa (Hariyanto, 2021). Families with good economic status will be able to obtain better public services such as education, health, road access, and others, which can affect the nutritional status of children.

The limited availability a variety of food at the household level is caused due to the family's low economic status ~~economic status~~; especially vegetables, so it is necessary to do innovation in utilizing yard land in order to meet the nutritional needs of the family. The use of yard land can increase family nutritional needs and family income. With these considerations, it is expected that the practical attitude of parents by making maximum utilization can increase the family economy and indirectly reduce the incidence of stunting by choosing the types of plants utilized in the yard area including vegetables, fruit and spices plants and harvested according to the family's daily food needs (Sutarto et al., 2023).

In accordance with the Presidential Regulation of the Republic of Indonesia No. 42 of 2013 on “*Gerakan Nasional Percepatan Perbaikan Gizi*”, the government can conduct cross-sectoral and institutional advocacy and outreach to mobilize support for utilizing yard land in improving malnutrition of children under five (Evitasari et al., 2013). The case-control design used in our study may have a number of limitations. The design required respondents to recall prior exposures which could introduce recall bias. However, this type of study design has been used to examine predictors of stunting in several countries.

#### 4. Conclusion

The results of the research found that infection or illness, feeding patterns, birth weight and economic status in infancy period was significantly associated with the under-five physical growth. The most dominant factor that significantly associated with physical growth is economic status with an OR of 6.701. The results can be used as input for the health program to improve routine monitoring by holding nutrition counseling sessions; nutrient-rich feeding by involving the frequency and types of food needs to be given to support healthy growth. The local government can enhance local culture by developing entrepreneurship using the potential of local culture so that it can be the key to creating innovative business opportunities so that it has a positive impact on the local economy and society. Further research needs to be done using a longitudinal or cohort design and also need to conduct in-depth research on economic status factors.

#### Acknowledgments

We would like to thank to Mrs. Fatimah, the Head of the Community Health Center Griya Antapani, who has provided an extraordinary opportunity to carry out our research in her work area. We would also wish to thank to all Puskesmas staffs who have helped us with a very good collaboration. This research would not have been successful without their cooperation and input.

#### References

Alfiah, S. N., & Setiyabudi, R. (2020). Hubungan pola asuh pemberian makan dan status ekonomi dengan kejadian balita pendek. *Human Care Journal*, 5(3), 742. <https://doi.org/10.32883/hcj.v5i3.767>

- Azriful, Bujawati, E., Aeni, S., & Yusdarif. (2018). Determinan kejadian stunting pada balita usia 24. *Al-Sihah : Public Health Science Journal*, 10(2), 192–203.
- Derek, C. G., & Bolang, A. S. L. (2023). *Stunting pada balita di wilayah kerja Puskesmas Jailolo Kabupaten Halmahera Barat*. 4, 1189–1202.
- Evitasari, Mulia, A., Avania, W. F., Sholikhah, N., Husamah, Syamsi, K., Fay, D. L., Slideshare.net, Hasri, H., & Dkk, P. (2013). Perpres 42 2013. *Slideshare.Net*, 2(1), 545–555.
- Hariyanto, D. (2021). Hubungan status sosial ekonomi keluarga dengan stunting pada balita di wilayah kerja Puskesmas Tembokrejo Kabupaten Jember. *Keperawatan*, 5.
- Islami, N. W., & Khouroh, U. (2021). Analisis faktor-faktor yang mempengaruhi balita stunting dan tantangan pencegahannya pada masa pandemi. *Karta Raharja*, 3(2), 6–19. <http://ejurnal.malangkab.go.id/index.php/kr>
- Kartinawati, K. T., Darwata, I. W., & Yanti, N. K. R. R. (2022). Faktor-faktor yang mempengaruhi kejadian stunting pada anak usia 2-5 tahun di Puskesmas Ubud 1 Gianyar. *E-Journal AMJ (Aesculapius Medical Journal)*, Vol.2 No.1(1), 26–34.
- Kemenkes RI. (2021). Hasil Studi Status Gizi Indonesia (SSGI) tingkat nasional, provinsi, dan kabupaten/kota tahun 2021. In *Kemenkes RI*. <https://doi.org/10.36805/bi.v2i1.301>
- Maineny, A., Longulo, O. J., & Endang, N. (2022). Hubungan riwayat penyakit infeksi dengan kejadian stunting pada balita umur 24-59 bulan di wilayah kerja Puskesmas Marawola Kabupaten Sigi. *Jurnal Bidan Cerdas*, 4(1), 10–17. <https://doi.org/10.33860/jbc.v4i1.758>
- Merita, M. (2019). Tumbuh kembang anak usia 0-5 tahun. *Jurnal Abdimas Kesehatan (JAK)*, 1(2), 83. <https://doi.org/10.36565/jak.v1i2.29>
- Modjo, D., Sudirman, A. A., & Hasan, A. (2023). Analisis faktor risiko kejadian stunting pada balita usia 24-59 bulan di wilayah kerja Puskesmas Motolohu Kabupaten Pohuwato. *Jambura Journal of Health Science and Research*, 5(1), 173–185.
- Nurbawena, H., Utomo, M. T., & Yunitasari, E. (2021). Hubungan riwayat sakit dengan kejadian stunting pada balita. *Indonesian Midwifery and Health Sciences Journal*, 3(3), 213–225. <https://doi.org/10.20473/imhsj.v3i3.2019.213-225>
- Purwani, Erni, & Mariyam. (2013). Pola pemberian makan dengan status gizi anak usia 1 sampai 5 tahun di Kabunan Taman Pematang. *Jurnal Keperawatan Anak*, 1(1), 30–36.
- Ramli, Agho, K. E., Inder, K. J., Bowe, S. J., Jacobs, J., & Dibley, M. J. (2009). Prevalence and risk factors for stunting and severe stunting among under-fives in North Maluku province of Indonesia. *BMC Pediatrics*, 9, 64. <https://doi.org/10.1186/1471-2431-9-64/FULLTEXT.HTML>
- Riyanti, F., & Hanifah, L. (2014). Hubungan pemberian asi eksklusif dengan perkembangan bayi usia 6 – 12 bulan di Desa Carikan Juwiring Klaten tahun 2013. *Jurnal Kebidanan Indonesia*, 5(2), 117–134. <https://doi.org/10.36419/jkebin.v5i2.182>
- Roesardhyati, R., & Kurniawan, D. (2021). Identifikasi faktor yang mempengaruhi pertumbuhan balita pendek (stunting). *Jurnal Kesehatan Mesencephalon*, 6(2). <https://doi.org/10.36053/mesencephalon.v6i2.276>
- Sa'diyah, K. (2019). Analisis aspek-aspek perkembangan bayi dan urgensi peran orang tua terhadap masalah-masalah bayi. *Jurnal Kariman*, 7(2), 315–328. <https://doi.org/10.52185/kariman.v7i2.113>
- Schoenbuchner, S. M., Dolan, C., Mwangome, M., Hall, A., Richard, S. A., Wells, J. C., Khara, T., Sonko, B., Prentice, A. M., & Moore, S. E. (2019). The relationship between wasting and stunting: A retrospective cohort analysis of longitudinal data in Gambian children from 1976 to 2016. *American Journal of Clinical Nutrition*, 110(2), 498–507. <https://doi.org/10.1093/ajcn/nqy326>
- Suherman, R., & Nurhaidah, N. (2020). Analisis faktor determinan stunting di Desa Pesa Kecamatan Wawo Kabupaten Bima. *Jurnal Manajemen Kesehatan Indonesia*, 8(2), 120–126. <https://doi.org/10.14710/jmki.8.2.2020.120-126>
- Sutarto, S., Sari, R. D. P., Utama, W. T., & Indriyani, R. (2023). Pengaruh pemanfaatan lahan pekarangan rumah terhadap kejadian stunting di Kabpaten Tanggamus, Provinsi Lampung. *Jurnal Kesehatan Masyarakat Indonesia*, 18(2), 14. <https://doi.org/10.26714/jkmi.18.2.2023.14-21>
- WHO. (n.d.). *Child growth*. WHO. [https://www.who.int/health-topics/child-growth#tab=tab\\_3](https://www.who.int/health-topics/child-growth#tab=tab_3)
- Yunita, L., & Surayana, D. (2021). Perkembangan personality sosial usia bayi dan toddler. *Jurnal Family Education*, 1(4), 14–22. <https://doi.org/10.24036/jfe.v1i4.20>