

## REVIEW ARTICLE

# Predictors of stunting, wasting, and being underweight in Indonesia: A literature review

DOI: 10.29063/ajrh2024/v28i10s.38

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## Abstract

Parents often perceive that stunting, wasting, and being underweight in their children are solely influenced by nutritional intake. In reality, various factors contribute to these outcomes. The objective of this study was to identify the factors associated with stunting, wasting, and being underweight in Indonesia. The design was a systematic literature review using the PRISMA procedure. The researchers applied a keyword search to databases collected via Science Direct, PubMed, ProQuest, SAGE and Emerald to find relevant articles published in English from 2016 to 2021. The results of the study found 17 relevant articles and revealed several factors associated with stunting, wasting and being underweight in Indonesia. All factors related to stunting, wasting, and underweight do not stand alone as the only predictors. Instead, they interact and contribute collectively to the occurrence of these conditions. (*Afr J Reprod Health* 2024; 28 [10s]: 358-367).

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**Keywords:** Predictor; stunting; wasting; underweight; Indonesia

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## Résumé

Les parents ont souvent l'impression que le retard de croissance, l'émaciation et l'insuffisance pondérale de leurs enfants sont uniquement influencés par l'apport nutritionnel. En réalité, divers facteurs contribuent à ces résultats. L'objectif de cette étude était d'identifier les facteurs associés au retard de croissance, à l'émaciation et à l'insuffisance pondérale en Indonésie. La conception était une revue systématique de la littérature utilisant la procédure PRISMA. Les chercheurs ont appliqué une recherche par mot clé aux bases de données collectées via Science Direct, PubMed, ProQuest, SAGE et Emerald pour trouver des articles pertinents publiés en anglais de 2016 à 2021. Les résultats de l'étude ont trouvé 17 articles pertinents et ont révélé plusieurs facteurs associés au retard de croissance, à l'émaciation, et une sous-pondération en Indonésie. Tous les facteurs liés au retard de croissance, à l'émaciation et à l'insuffisance pondérale ne constituent pas les seuls prédicteurs. Au lieu de cela, ils interagissent et contribuent collectivement à l'apparition de ces conditions.

. (*Afr J Reprod Health* 2024; 28 [10s]: 358-367).

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**Mots-clés:** Prédicteur ; retard de croissance; dépérissement; insuffisance pondérale; Indonésie

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## Introduction

The incidence of stunting, wasting, and being underweight or underweight are of concern to parents, especially mothers and husbands. Indonesia as a developing country has relatively low economic growth levels, resulting in high rates of stunting, wasting and being underweight. Incidents such as stunting can be seen in the growth and development of children under the age of 5

years. The child can be stunted if the child's growth and development experiences disturbances or obstacles rather than expected growth. Events such as stunting, wasting and being underweight negatively impact children's cognitive function, academic performance, and physical performance and result in various chronic diseases if the incidence is greater than 39%<sup>1,2</sup>. One of them is the decline in cognitive function. Events such as stunting, wasting, and being underweight also result

in degenerative diseases in the final phase of a person's life.

A study found that the underweight rate for children under five years in Southeast Sulawesi was still higher than the minimum percentage set by the national average, 16.3% compared to 13.0%<sup>3,4</sup>. Beside the stunting rate with the prevalence of 164.8 million, low-weight and wasting prevalence, 100.7 million and 51.5 million, are still higher than the national average<sup>5</sup>. Meanwhile, several provinces in Indonesia have high stunting, wasting and underweight rates. One of them is East Nusa Tenggara, Gorontalo<sup>6</sup>.

At first glance, these three incidents were indeed influenced by poor nutrition and inadequate breast milk. From the womb to old age, nutrition is essential in the human life cycle<sup>7,8</sup>. This idea also receives attention from the government, which implemented the 1000 HPK Movement<sup>9</sup>. Being underweight is synonymous with inadequate nutritional intake for pregnant women and their fetuses. One of the nutritional intakes referred to is essential amino acids<sup>10,11</sup>. Various factors cause the occurrence of these nutritional problems. However, we believe there are other factors associated with stunting, wasting, and being underweight in Indonesia<sup>12</sup>. Therefore, the objective of this study is to determine the factors associated with stunting, wasting and underweight incidence in Indonesia

## Methods

### *Literature search procedure*

The research used a systematic literature review design with the Preferred Reporting Items for Systematic Review (PRISMA) and meta-analysis procedures<sup>13</sup>. The study searched the selected database of 1,320 study articles from ScienceDirect, PubMed, ProQuest, SAGE and Emerald. Researchers obtained the results of duplication screening to identify the suitability of the abstracts with the study inclusion criteria and obtained a total of 658 articles. Furthermore, as many as 167 articles written in English from 2016 to 2021 were found to be relevant to the topic. The keywords and the rest were then reviewed based on their full text using the Rayyan platform (<https://www.rayyan.ai/>) to organize the review<sup>13</sup>. A total of 26 articles were discarded because most

of the articles did not discuss the determinants of stunting, wasting and underweight and the texts were incomplete. Thus, 17 articles were selected for review to get an overview of the factors associated with stunting, wasting, and underweight and how the causal factors are related. The method of selection is summarized through a flowchart (Figure 1).

### *Characteristics of included studies*

The articles analyzed malnutrition-related factors (stunting, wasting and being underweight) and targeted children under five. Study locations were in Indonesia, they were cross-sectional study designs, surveys and observational studies. The study implemented steps starting from searching for articles, checking for duplication, filtering the articles, and reviewing the articles obtained. The researcher applies several steps at each step, using specific keywords – stunting, wasting, and being underweight in Indonesia, and taking accessible articles.

### *Data extraction*

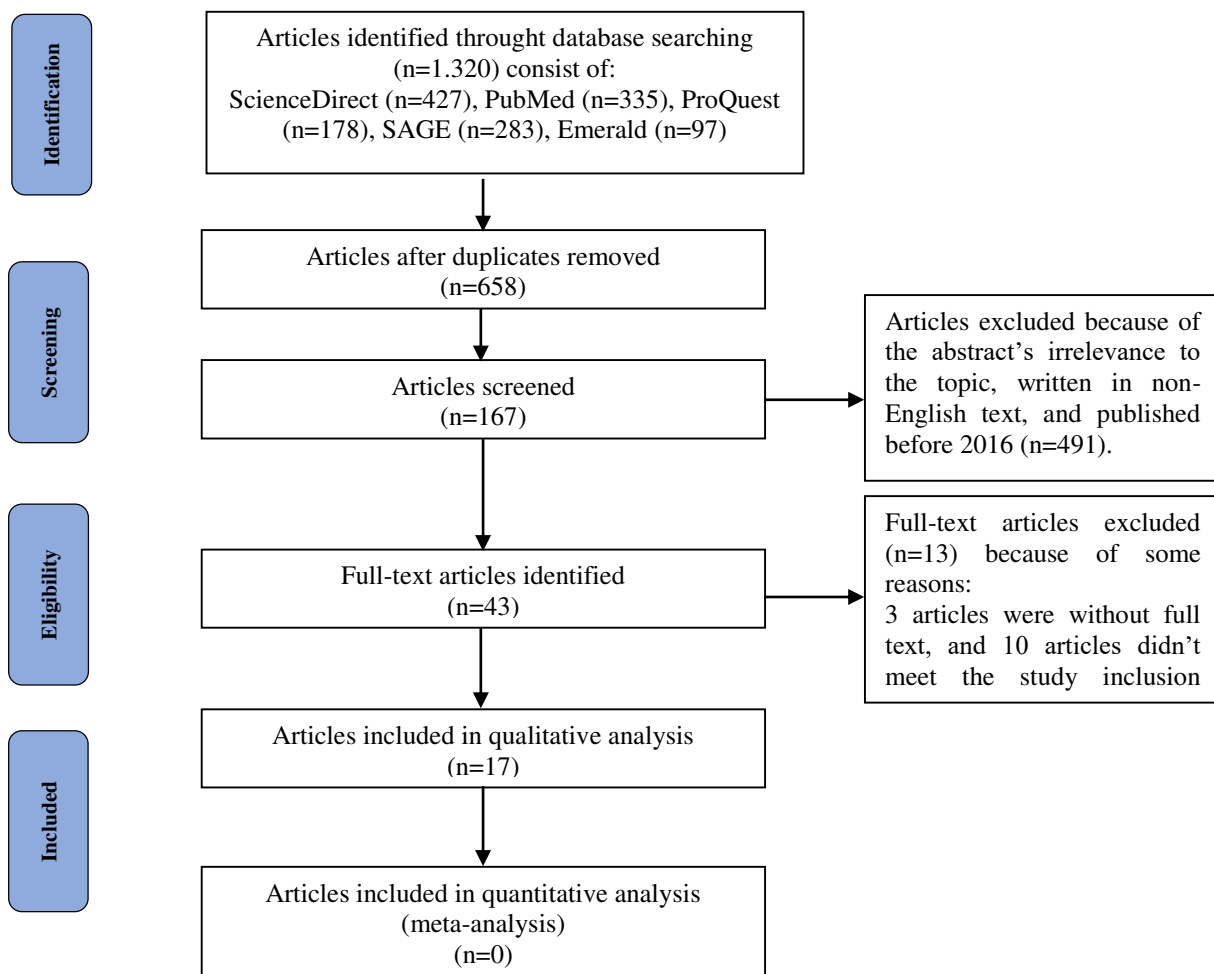
Data that met the inclusion criteria were entered into the custom template presented in Table 1. The author then performed two independent data extractions and determined important information in the study, such as the author's name, location, number of samples, methods and results.

### *Ethical considerations*

The study was approved by the Health Research Ethics Committee, Mandala Waluya University (date: February 20, 2023, decision no: 06/KEP/UMW/II/2023, protocol no: 20220230506).

## Results

The most consistent factors associated with stunting, wasting and being underweight, as shown in Table 1, were anaemic pregnant women, exclusive breastfeeding, low birth weight (LBW), mother's body mass index (BMI), male toddlers, total parity, father's education, mother's education, child's age and administrative area<sup>5,7,9,14-17</sup>. In addition to the above factors, the study identified



**Figure 1:** PRISMA flowchart showing search and selection of studies

water sanitation and maintenance, low birth weight (LBW), number of children and age of children, antenatal care, gender, mother's age, mother's height, exclusive breastfeeding, parental education, complete immunization, family income as contributing factors to the incidence of stunting<sup>5,7,9,11–15,17–19</sup>. Table 1

The most dominant factors causing stunting were low birth weight, number of children per family, and age, and education. These factors were reported in at least three studies. In addition to the factors associated with, those related to wasting were identified. The lack of breastfeeding affects the incidence of wasting. Out of 25 children who were not exclusively breastfed, 11 experienced wasting, while of 75 children who were breastfed, only 10 experienced wasting.

Antenatal visits affect the level of nutrition during pregnancy which results in wasting. We were able to establish that the relationships in these findings were indirect. Specifically, less antenatal care was associated with wasting. The researchers found that out of 55 pregnant women, pregnant women with less than four antenatal visits experienced wasting or wasting in their children in 14 cases<sup>9</sup>.

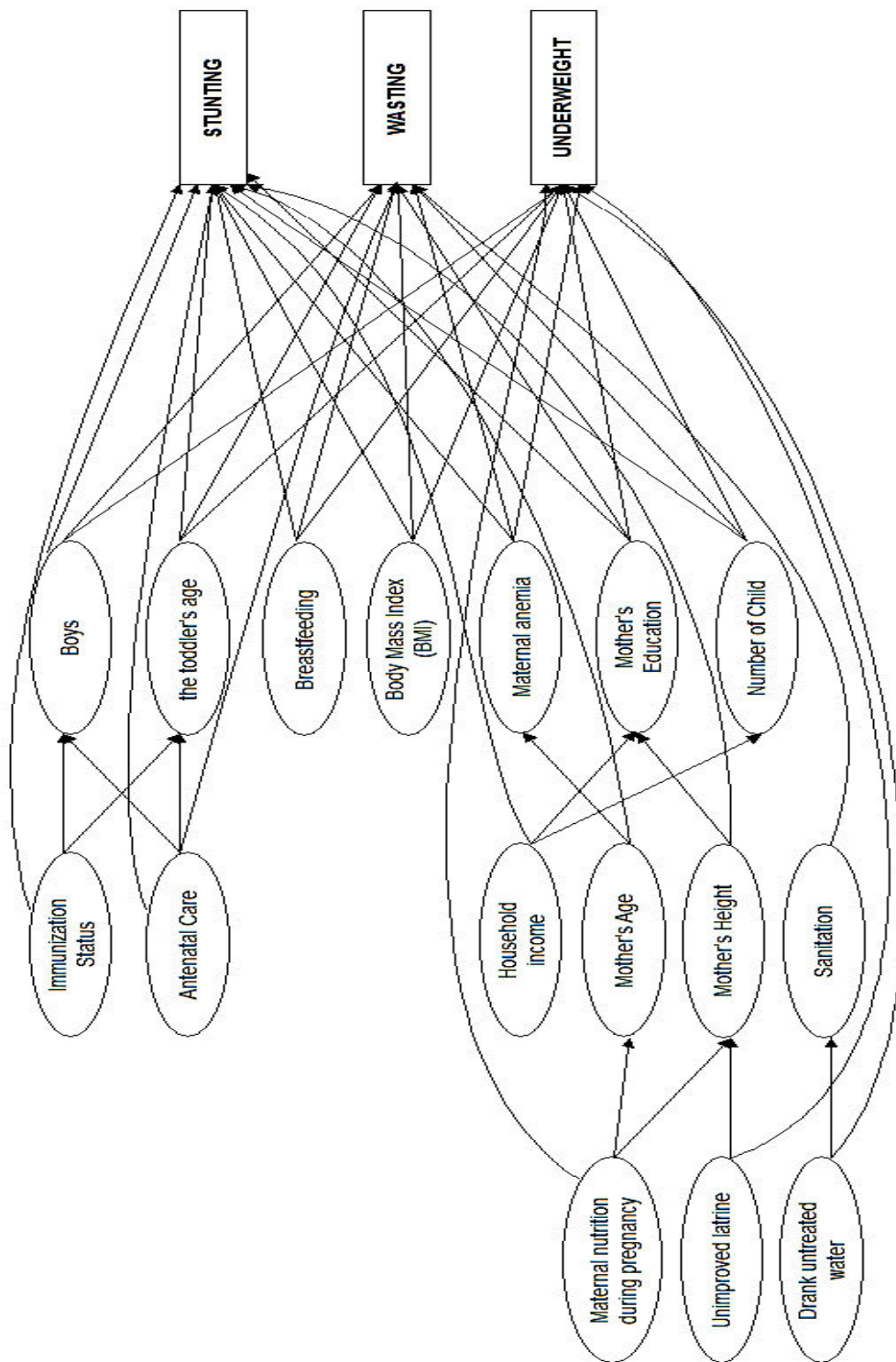
Conditions associated with severe malnutrition also had an impact on wasting. The study found that the incidence of wasting or wasting was 17.1%, with a cut-off wasting value of 15%<sup>6</sup>. The study found evidence of a relationship between the factors causing the incidence of being underweight. These included insufficient household water supply, unhealthy latrines, and

**Table 1:** Data extraction sheet

Author (year)	Location	Number of Samples	Method	Factor associated Stunting	Wasting	Being underweight
Torlesse et al. (2016) <sup>20</sup>	East Nusa Tenggara Province, Papua and Central Java.	1366 children aged 0-23 months	cross-sectional study	households that drank untreated water used an unimproved latrine, older child age, male sex and lower wealth quintile.	-	-
Tasnim et al. (2017) <sup>21</sup>	Southeast Sulawesi	400 children	Case-control study	-	-	Lack of availability of water, lack of availability of healthy restrooms at home and poor quality of roofing materials
Aryastami et al. (2017) <sup>22</sup>	Indonesia	3024 children aged 12–23 months	Survey	Babies born with LBW, Boys, babies with a history of neonatal disease, and poverty.	-	-
Ahmad et al (2018) <sup>19</sup>	Aceh	392 children aged 6 – 23 months	cross-sectional study	Child's age, ARI, consumption of fortified foods.	Order of birth, level of education of father and mother, family size, completion of vaccination according to age and frequency of fish consumption	Child's age, birth order, birth weight, father's and mother's education level, family size, diarrhea.
Simbolon et al. (2019) <sup>18</sup>	Indonesia	3589 children and under-five year	Survey	Birth Weight, Number of Children, Gender, Birth Age, years old, Mother's Height, Mother's Education, Immunization Status, Short, Residence and Fe tablet use	-	-
Flynn et al. (2020) <sup>5</sup>	East Nusa Tenggara	408 children under five		Maternal height, Child's birthweight, number of parities, maternal mid-upper arm circumference, Intrauterine growth.	-	Child's birthweight, Maternal education, Maternal age during pregnancy, Maternal height, pregnancy, paternal education and number of parities.

Author (year)	Location	Number of Samples	Method	Factor associated Stunting	Wasting	Being underweight
Basri & Hadju (2020) <sup>7</sup>	East Luwu district, South Sulawesi	181 infants aged 0–23 months	cross-sectional study	Exclusive breastfeeding	-	Exclusive breastfeeding
Zakaria et al. (2020) <sup>15</sup>	Gorontalo, South Sulawesi	76 children aged 24-59 months	cross-sectional study	High education level, good parenting style, Birth space <2 years	-	-
Laksono et al. (2020) <sup>23</sup>	Madura Island, East Java	1,160 toddlers aged 0-59 months		Child's age, mother's education and mother's occupation.	-	-
Setia et al. (2021) <sup>14</sup>	Kupang, East Nusa Tenggara	One hundred children aged 6-23 months.	Retrospective cohort study	Anemia in pregnant women, lack of protein energy, giving colostrum, giving exclusive breast milk and complementary foods.	Exclusive breastfeeding, anaemia during pregnancy, and status of antenatal care.	Exclusive breastfeeding, birth weight, and anaemia during pregnancy.
Badruddin et al. (2017) <sup>16</sup>	Jeneponto district, South Sulawesi	340 children aged 24-36 months	cross-sectional study	aspects of motor and socio-emotional development	-	-
Maulidiana & Sutjiati (2021) <sup>11</sup>	Malang City, East Java, Indonesia	24–59 month old children	case-control study	family income, being underweight, breastfeeding for fewer than six months, he lacks EAA methionine intake	-	-
Sartika et al. (2021) <sup>12</sup>	Sambas District, West Kalimantan Province Indonesia	559 infants aged 0–11 months	cross-sectional study	Low birth weight (LBW), diarrhoea, premature birth, short mother, and incomplete basic immunization coverage.	-	-
Djuardi et al. (2021) <sup>6</sup>	Nangapanda, Ende, East Nusa Tenggara	393 children aged 12- 59 months	cross-sectional study	Age, gender, birth interval, mother's body mass index, LBW, father's education.	Age, gender, mother's body mass index, LBW, father's education.	Age, gender, birth interval, mother's body mass index, LBW, father's education.

<b>Author (year)</b>	<b>Location</b>	<b>Number of Samples</b>	<b>Method</b>	<b>Factor associated Stunting</b>	<b>Wasting</b>	<b>Being underweight</b>
Kurnianingtyas et al. (2021) <sup>10</sup>	North Sumatra	child aged 24-59 months		-	-	Child Sex, cigarette consumption and Mother's body mass index,
Huriah et al. (2021) <sup>17</sup>	Yogyakarta	71 children aged 6-59 months	case-control study	birth weight and mother's occupation	-	-
Akbar et al. (2021) <sup>24</sup>	Southeast Sulawesi, Maluku, North Maluku, West, East Nusa Tenggara, East Kalimantan, Papua and Papua	<b>1093 children aged 0-59 months</b>	Survey	maternal Body Mass Index (BMI), paternal education, quality of sanitation, birth order and relative wealth	-	-



**Figure 2:** Web of causation stunting, wasting dan underweight

poor roof quality<sup>21</sup>. Babies with birth weights below 2500 grams had an increased risk of being underweight<sup>5,9,10</sup>. In addition, limited child growth

and development, child sex and antenatal care visits and exclusive breastfeeding affect the incidence of being underweight. Meanwhile, for

pregnant women, factors such as height, age of the mother and maternal nutrition during pregnancy, such as being underweight and experiencing anaemia, were associated with being underweight in children to be underweight<sup>5-7,9,10</sup>. All factors can form a "causal network" where causes are related to each other. The causal network tries to identify all possibilities that can influence health conditions, both health and disease<sup>25</sup>. Thus, the factors that form the web for causation of stunting, wasting and underweight are presented in Figure 2.

## Discussion

Based on the study's findings, there is a relationship between the incidence of being underweight, and stunting and wasting. For instance, water availability and proper sanitation, such as good latrines, play roles in reducing the incidence of being underweight<sup>26</sup>. Reducing the incidence of being underweight can also contribute to suppressing stunting<sup>27</sup>. Efforts to reduce the occurrence of stunting, wasting, and being underweight can be achieved through regular attendance of health care and antenatal visits. Participating in antenatal care or visits allows mothers to increase their knowledge about their pregnancies, including the importance of exclusive breastfeeding. Statistical evidence demonstrates that exclusive breastfeeding reduces the incidence of being underweight, thus preventing stunting and wasting<sup>28,29</sup>.

Furthermore, the study revealed that low birth weight influences the incidence of being underweight and stunting. Low birth weight is affected by inadequate nutrition during pregnancy, and insufficient nutrition can also lead to wasting in children. Therefore, mothers must maintain proper nutrition<sup>30</sup>. Additionally, efforts to ensure pregnant women maintain adequate nutrition cannot be separated from the role of the husband or family. Families with low incomes indirectly impact wasting, being underweight, and stunting<sup>31,32</sup>. The literature review suggests that stunting is more prevalent in boys than girls, as boys generally have higher food needs. Consequently, families with lower incomes or incomes below the minimum wage indirectly contribute to the incidence of stunting<sup>33</sup>.

Insufficient income also results in poor housing conditions, including water quality, latrine maintenance, and roof quality<sup>33,34</sup>. These factors directly contribute to the occurrence of stunting and being underweight. Then, gender factors that can influence malnutrition such as stunting, wasting and underweight in children can be caused by anthropometric failure<sup>35</sup>.

The study also identified a higher incidence of stunting and underweight among mothers under 20 years old whose reproductive organs have not fully developed. Similarly, mothers under 150cm in height face a higher risk of their children experiencing stunting and being underweight<sup>36</sup>. A mother's height below 150cm leads to limited growth and development of the fetus in the womb, increasing the risk of low weight. An indirect relationship exists between stunting, wasting, being underweight, and parental education. Well-educated parents possess greater awareness about pregnancy and are more capable of earning a decent income to meet the nutritional needs of pregnant women, as well as ensuring proper water, sanitation, and housing conditions.

### *Strengths and limitations*

This literature review discusses stunting, wasting which is underweight in children in Indonesia. The first limitation of this research is that the method only includes literature for quantitative research and does not include qualitative or experimental research. Second, the results of the literature review concluded personal causes of stunting, wasting and underweight but did not discuss fundamental causes such as genetic history and abnormal child conditions which greatly influence children's growth and development. **Policy**

### *Implications*

The findings from this literature review can be helpful for policymakers and public health researchers to prove the most consistent determinants of malnutrition in Indonesia and tackle the problem of malnutrition in every region in Indonesia. The policy should focus on the parent's education level, the condition of pregnant women and sanitation conditions that can impact malnutrition.

## Conclusion

From the literature review results, the researchers concluded that stunting, wasting, and being underweight are not only affected by poor nutrition and inadequate breastmilk intake. The results of this literature review indicate that the causes of stunting included water management, low birth weight, number of children and age of children, antenatal care, gender, age, mother's height, exclusive breastfeeding, parental education, complete immunization, intake of essential amino acids, and family income. Factors causing wasting include breastfeeding, nutritional status during pregnancy, antenatal care, and malnutrition. Then, the factors associated with the incidence of being underweight are the availability of water, the availability of restrooms, the quality of the roof of the house, low birth weight, limited growth and development in the womb, the height of pregnant women, age of pregnant women, maternal parity, breastfeeding, antenatal visits, nutrition during pregnancy, and gender. These factors do not stand alone and are the sole cause of stunting, wasting and being underweight. For example, exclusive breastfeeding appears to cause all three events. However, it turns out that parents' education also influences awareness of exclusive breastfeeding.

## Authors' contributions

Fitri Rachmillah Fadmi: developed the study, conducted the search, selected studies, analyzed and wrote the first draft of the transcript.

Kuntoro: research supervisor.

Bambang Widjanarko Otok, Soenarnatalina Melaniani and Sri Mulyani: Critical revision of this research.

## Conflict of interest:

The authors declare no conflict of interest.

## Acknowledgement

The author would like to thank the Center for Higher Education Fund, Indonesia Endowment Funds for Education, Center for Education Financial Services, Ministry of Education, Culture, Research and Technology of Indonesia as education fund providers and Universitas Mandala Waluya.

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