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Nutrition intake and causative factor of stunting among children aged under-5 years in Lamongan city

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KEYWORDS

Nutrition intake;
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Abstract

Objective: The study aimed to analyze the nutrition intake and causative factor of stunting among children aged under 5 years in Lamongan City.

Methods: This study was using the observational analytic with a cross-sectional study using a questionnaire to define the nutrition intake and causative factor of stunting among children in 4 districts. This study recruited 40 children aged under 5 years (24–59 months) which are selected using simple random sampling techniques from May to June 2019.

Results: The average intake of energy, protein, calcium, and phosphor in respondents was 77.23% RDA, protein 69.82% RDA, calcium 79.74% RDA, and phosphor 68.75% RDA, respectively. Out of 40 stunting children were suffering from infectious disease during period 3 months (67.5%). Parent's education (mothers and fathers) had low education (70% and 72.5%), and 65% of mother's from respondents has no job.

Conclusion: Causative factor of stunting among children aged under 5 years in Lamongan City was less nutritional intake, infection disease, and parents characteristic. The evidence in this research primarily align with common The World Health Organization conceptual framework on childhood stunting.

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Introduction

Stunting is one of the nutritional problems faced in the world, especially in poor and developing countries. In Indonesia, the stunting rate is quite high, which is around 7.8 million out of 23 million children or around 35.6 percent.¹ Based on data from the Health Office as of August 2018, the prevalence of stunting was around 22 percent in East Java. Around 12 out of 38 districts/cities appears with

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stunting, the regencies that were included in the treatment of stunting were Bangkalan, Sampang, Pamekasan, Sumenep, Jember, Bondowoso, Probolinggo, Nganjuk, Lamongan, Malang, Trenggalek and Kediri.² Many factors cause a high incidence of stunting in infants. The direct cause is the lack of food intake and the presence of infectious diseases.³ Inadequate energy and nutrient intake, and infectious diseases are very important factors in stunting problems. The quality and quantity of protein intake affects plasma levels of insulin growth factor I (IGF-I) and also on bone matrix proteins and growth factors that play a role in bone formation.⁴ Some other micronutrients such as calcium and phosphor are also very important in the linear growth of children.⁵

Increased stunting in infants can be reduced if risk factors are controlled and eliminated.⁶ Basically the nutritional status of children can be influenced by direct and indirect factors, the direct factors associated with stunting are child characteristics in the form of male sex, low birth weight, food consumption in the form of low energy intake and low protein intake, other direct factors namely health status of infection with Acute Respiratory Infection (ARI) and diarrhea. The pattern of care, not exclusive breastfeeding, health services in the form of incomplete immunization status, and family characteristics in the form of parental work, parental education and family economic status are indirect factors that affect stunting.⁷ This study aimed to analyze the nutrition intake and causative factor of stunting among children aged under 5 years in Lamongan City.

Methods

Population and study setting

The study design was an observational analytic with a cross-sectional study using a questionnaire to define the nutrition intake and causative factor of stunting among children in Glagah, Sukorame, Paciran, and Brondong Subdistrict, Lamongan Regency. This study recruited 40 stunting children aged under 5 years (24–59 months) from those 4 subdistricts which are selected using simple random sampling techniques from May to June 2019. The research was approved by the Institutional Review Board from Airlangga University and all participants were provided the informed consent form which necessary signed by their parents or guardian.

Variables

This study used a questionnaire to collect data among children which comprised of 3 parts: respondent characteristic, nutrition intake (energy, protein, calcium and phosphor intake) and causative factor of stunting (birth weight, infectious disease, breastfeeding practice, immunization status, parent's education, mothers job and income per capita).

Data collection

Data collection was carried out by four trained enumerators from Bachelor of Nutrition students. Nutrition intake data were obtained using food recall method 1 × 24h four times in four consecutive weeks using a food recall sheet.

Data on children food consumption were analyzed for nutrition using Nutrisurvey software and then compared with the Recommended Dietary Allowance (RDA) for children aged under 5 years. Nutrition intake considerable were sufficient and insufficient as intake value 75–80% RDA and <75% RDA, respectively.

Data from anthropometric measurements including height and weight were obtained using a microtoise with a precision of 0.1 cm and a digital weighing scale with an accuracy of 0.1 kg. The data obtained were compared with WHO standard using weight-for-age to determine nutritional status, height-for-age index, and weight-for-height to determine stunting status, using the WHO child growth standards 2005.⁸

Causative factor variables were adapted from The World Health Organization conceptual framework on childhood stunting.⁸ The questionnaire comprises of birth weight, infectious disease (diarrhea and ARI), breastfeeding practices, immunization status, mother's education, mother's job, father education and income per capita.

Data analysis

All statistical analyses were performed using SPSS Statistics version 22.0 (IBM Corp., Armonk, NY). WHO AnthroPlus was used to calculate the nutrition status of respondents. Frequency and means were used to describe the distribution of causative factor of stunting in the research area.

Results

Most of the research respondents were 37–48 months old (57.5%) and female (57.5%). Based on nutritional status weight-for-age indicators most respondents had normal nutritional status (52.5%) (Table 1). The average intake of energy, protein, calcium and phosphor in respondents below the Recommended Dietary Allowance (RDA), with an average energy of 77.23% RDA, protein 69.82% RDA, calcium 79.74% RDA, and phosphor 68.75% RDA, respectively as in Table 2.

The result in Table 3 showed several causative factors of stunting among children. Out of 40 children were suffer-

Table 1 Frequency distribution of characteristics respondent.

Variable	Frequency (n)	Percentages (%)
<i>Age of respondents</i>		
24–36 months	11	27.5
37–48 months	23	57.5
49–59 months	6	15
<i>Gender</i>		
Male	17	42.5
Female	23	57.5
<i>Weight-for-age</i>		
Normal (−2SD < Z-score < +2SD)	21	52.5
Underweight (Z-score < −2SD)	19	47.5

Table 2 Mean scores of nutrient intake respondents.

Variables	Means
Energy intake (kcal)	965.38
Percentages RDA (%) ^a	77.23
Protein intake (g)	27.23
Percentages RDA (%) ^b	69.82
Calcium intake (mg)	398.7
Percentages RDA (%) ^c	79.74
Phosphor intake (mg)	275.0
Percentages RDA (%) ^d	68.75

^a RDA energy intake for children aged under 5 years = 1500 kcal.

^b RDA protein intake for children aged under 5 years = 39 g.

^c RDA calcium intake for children aged under 5 years = 500 mg.

^d RDA phosphor intake for children aged under 5 years = 4500 mg.

Table 3 Causative factors of stunting of respondents.

Variable	Frequency (n)	Percentage (%)
<i>Birth weight</i>		
Normal (>2500 g)	38	95.0
Low (<2500 g)	2	5.0
<i>Infectious disease during 3 months</i>		
Yes	27	67.5
No	13	32.5
<i>Breastfeeding practice</i>		
Exclusive breastfeeding (0-6 months)	22	55.0
Nonexclusive breastfeeding (<6 months)	18	45.0
<i>Immunization status</i>		
Complete	35	87.50
Incomplete	5	12.50
<i>Mother's education</i>		
High	12	30.0
Low	28	70.0
<i>Mother's job</i>		
Work	14	35.00
None	26	65.00
<i>Father's education</i>		
High	11	27.5
Low	29	72.5
<i>Income per capita</i>		
Needy	28	70.00
Sufficient	12	30.00

125 ing from infectious disease during period 3 months (67.5%).
126 Parent's education (mothers and fathers) had low education
127 (70% and 72.5%), and 65% of mother's from respondents has
128 no job.

129 **Discussion**

130 The results showed that children stunting nutrition intake
131 (energy, protein, calcium and phosphor) averaged below the

RDA. This study is aligned with the research which state that there is a significant relationship between energy consumption and the incidence of stunting in infants in Sumatra.⁶ This is because inadequate nutritional intake, especially from total energy, is directly related to physical growth deficits in children. In line with the results of a study that low energy consumption is a major factor as a cause of stunting in children in Indonesia.⁶

The average protein intake of research respondents was low category. Data analysis in different provinces, there was a significant relationship between protein consumption and the incidence of stunting in infants. Protein is important for the normal functioning of almost all cells and metabolic processes, thus this nutrient deficit has many clinical effects. Low protein intake can be influenced by infectious diseases that occur in stunting children resulting in a lack of appetite so that the consumption of food in children becomes reduced.⁵

The calcium and phosphor intake of the study respondents included in the sufficient category. In line with the study that calcium intake was significantly lower in stunting children than non-stunting children. Calcium deficiency will affect linear growth if the calcium content in bone is less than 50% of normal content. In infants, lack of calcium in the bones can cause rickets, whereas in children, lack of calcium deposits can cause growth retardation. Prolonged phosphor deficiency will cause osteomalacia and can cause calcium release from bone.⁴

In Sumatra, there was an increase in the prevalence of stunting of children aged 24-59 months due to the influencing factors, namely children low energy intake and family characteristics. The study in Bengkulu that children with a history of ARI often within a year had a 5 times greater chance of stunting under-fives than non-stunting children. Children at risk of infectious disease were 1.69 times more likely to experience stunting than those who did not have an infectious disease.⁴ This study aligns with these two research in the other part of Indonesia as a causative factor of stunting.

171 **Conclusion**

172 The evidence in this reset primarily align with common The
173 World Health Organization conceptual framework on child-
174 hood stunting. Causal factor of stunting among children
175 aged under 5 years in Lamongan City was less nutritional
176 intake, infection disease, and parents characteristic. Spatial
177 analysis of secondary data containing deeper child stunting
178 determinants should be conducted to allow interventions to
179 vary geographically according to the local field.

180 **Conflict of interests**

181 The authors declare no conflict of interest.

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Introduction

Stunting is one of the nutritional problems faced in the world, especially in poor and developing countries. In Indonesia, the stunting rate is quite high, which is around 7.8 million out of 23 million children or around 35.6 percent.¹ Based on data from the Health Office as of August 2018, the prevalence of stunting was around 22 percent in East Java. Around 12 out of 38 districts/cities appears with

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stunting, the regencies that were included in the treatment of stunting were Bangkalan, Sampang, Pamekasan, Sumenep, Jember, Bondowoso, Probolinggo, Nganjuk, Lamongan, Malang, Trenggalek and Kediri.² Many factors cause a high incidence of stunting in infants. The direct cause is the lack of food intake and the presence of infectious diseases.³ Inadequate energy and nutrient intake, and infectious diseases are very important factors in stunting problems. The quality and quantity of protein intake affects plasma levels of insulin growth factor I (IGF-I) and also on bone matrix proteins and growth factors that play a role in bone formation.⁴ Some other micronutrients such as calcium and phosphorus are also very important in the linear growth of children.⁵

Increased stunting in infants can be reduced if risk factors are controlled and eliminated.⁶ Basically the nutritional status of children can be influenced by direct and indirect factors, the direct factors associated with stunting are child characteristics in the form of male sex, low birth weight, food consumption in the form of low energy intake and low protein intake, other direct factors namely health status of infection with Acute Respiratory Infection (ARI) and diarrhea. The pattern of care, not exclusive breastfeeding, health services in the form of incomplete immunization status, and family characteristics in the form of parental work, parental education and family economic status are indirect factors that affect stunting.⁷ This study aimed to analyze the nutrition intake and causative factor of stunting among children aged under 5 years in Lamongan City.

Methods

Population and study setting

The study design was an observational analytic with a cross-sectional study using a questionnaire to define the nutrition intake and causative factor of stunting among children in Glagah, Sukorame, Paciran, and Brondong Subdistrict, Lamongan Regency. This study recruited 40 stunting children aged under 5 years (24–59 months) from those 4 subdistricts which are selected using simple random sampling techniques from May to June 2019. The research was approved by the Institutional Review Board from Airlangga University and all participants were provided the informed consent form which necessary signed by their parents or guardian.

Variables

This study used a questionnaire to collect data among children which comprised of 3 parts: respondent characteristic, nutrition intake (energy, protein, calcium and phosphorus intake) and causative factor of stunting (birth weight, infectious disease, breastfeeding practice, immunization status, parent's education, mothers job and income per capita).

Data collection

Data collection was carried out by four trained enumerators from Bachelor of Nutrition students. Nutrition intake data were obtained using food recall method 1 × 24 h four times in four consecutive weeks using a food recall sheet.

Data on children food consumption were analyzed for nutrition using Nutrisurvey software and then compared with the Recommended Dietary Allowance (RDA) for children aged under 5 years. Nutrition intake considered were sufficient and insufficient as intake value 75–80% RDA and <75% RDA, respectively.

Data from anthropometric measurements including height and weight were obtained using a microtoise with a precision of 0.1 cm and a digital weighing scale with an accuracy of 0.1 kg. The data obtained were compared with WHO standard using weight-for-age to determine nutritional status, height-for-age index, and weight-for-height to determine stunting status, using the WHO child growth standards 2005.⁸

Causative factor variables were adapted from The World Health Organization conceptual framework on childhood stunting.⁸ The questionnaire comprises of birth weight, infectious disease (diarrhea and ARI), breastfeeding practices, immunization status, mother's education, mother's job, father education and income per capita.

Data analysis

All statistical analyses were performed using SPSS Statistics version 22.0 (IBM Corp., Armonk, NY). WHO AnthroPlus was used to calculate the nutrition status of respondents. Frequency and means were used to describe the distribution of causative factor of stunting in the research area.

Results

Most of the research respondents were 37–48 months old (57.5%) and female (57.5%). Based on nutritional status weight-for-age indicators most respondents had normal nutritional status (52.5%) (Table 1). The average intake of energy, protein, calcium and phosphorus in respondents below the Recommended Dietary Allowance (RDA), with an average energy of 77.23% RDA, protein 69.82% RDA, calcium 79.74% RDA, and phosphorus 68.75% RDA, respectively as in Table 2.

The result in Table 3 showed several causative factors of stunting among children. Out of 40 children were suffer-

Table 1 Frequency distribution of characteristics respondent.

Variable	Frequency (n)	Percentages (%)
<i>Age of respondents</i>		
24–36 months	11	27.5
37–48 months	23	57.5
49–59 months	6	15
<i>Gender</i>		
Male	17	42.5
Female	23	57.5
<i>Weight-for-age</i>		
Normal ($-2SD < Z\text{-score} < +2SD$)	21	52.5
Underweight ($Z\text{-score} < -2SD$)	19	47.5

Table 2 Mean scores of nutrient intake respondents.

Variables	Means
Energy intake (kcal)	965.38
Percentages RDA (%) ^a	77.23
Protein intake (g)	27.23
Percentages RDA (%) ^b	69.82
Calcium intake (mg)	398.7
Percentages RDA (%) ^c	79.74
Phosphor intake (mg)	275.0
Percentages RDA (%) ^d	68.75

^a RDA energy intake for children aged under 5 years = 1500 kcal.

^b RDA protein intake for children aged under 5 years = 39 g.

^c RDA calcium intake for children aged under 5 years = 500 mg.

^d RDA phosphor intake for children aged under 5 years = 4500 mg.

Table 3 Causative factors of stunting of respondents.

Variable	Frequency (n)	Percentage (%)
<i>Birth weight</i>		
Normal (>2500 g)	38	95.0
Low (<2500 g)	2	5.0
<i>Infectious disease during 3 months</i>		
Yes	27	67.5
No	13	32.5
<i>Breastfeeding practice</i>		
Exclusive breastfeeding (0–6 months)	22	55.0
Nonexclusive breastfeeding (<6 months)	18	45.0
<i>Immunization status</i>		
Complete	35	87.50
Incomplete	5	12.50
<i>Mother's education</i>		
High	12	30.0
Low	28	70.0
<i>Mother's job</i>		
Work	14	35.00
None	26	65.00
<i>Father's education</i>		
High	11	27.5
Low	29	72.5
<i>Income per capita</i>		
Needy	28	70.00
Sufficient	12	30.00

ing from infectious disease during period 3 months (67.5%). Parent's education (mothers and fathers) had low education (70% and 72.5%), and 65% of mother's from respondents has no job.

Discussion

The results showed that children stunting nutrition intake (energy, protein, calcium and phosphor) averaged below the

RDA. This study is aligned with the research which state that there is a significant relationship between energy consumption and the incidence of stunting in infants in Sumatra.⁶ This is because inadequate nutritional intake, especially from total energy, is directly related to physical growth deficits in children. In line with the results of a study that low energy consumption is a major factor as a cause of stunting in children in Indonesia.⁶

The average protein intake of research respondents was low category. Data analysis in different provinces, there was a significant relationship between protein consumption and the incidence of stunting in infants. Protein is important for the normal functioning of almost all cells and metabolic processes, thus this nutrient deficit has many clinical effects. Low protein intake can be influenced by infectious diseases that occur in stunting children resulting in a lack of appetite so that the consumption of food in children becomes reduced.⁵

The calcium and phosphor intake of the study respondents included in the sufficient category. In line with the study that calcium intake was significantly lower in stunting children than non-stunting children. Calcium deficiency will affect linear growth if the calcium content in bone is less than 50% of normal content. In infants, lack of calcium in the bones can cause rickets, whereas in children, lack of calcium deposits can cause growth retardation. Prolonged phosphor deficiency will cause osteomalacia and can cause calcium release from bone.⁴

In Sumatra, there was an increase in the prevalence of stunting of children aged 24–59 months due to the influencing factors, namely children low energy intake and family characteristics. The study in Bengkulu that children with a history of ARI often within a year had a 5 times greater chance of stunting under-fives than non-stunting children. Children at risk of infectious disease were 1.69 times more likely to experience stunting than those who did not have an infectious disease.⁴ This study aligns with these two research in the other part of Indonesia as a causative factor of stunting.

Conclusion

The evidence in this reset primarily align with common The World Health Organization conceptual framework on childhood stunting. Causal factor of stunting among children aged under 5 years in Lamongan City was less nutritional intake, infection disease, and parents characteristic. Spatial analysis of secondary data containing deeper child stunting determinants should be conducted to allow interventions to vary geographically according to the local field.

Conflict of interest

The authors declare no conflict of interest.

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