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Research Articles

Correlation between exclusive breastfeeding and obesity among children at kindergartens in Una-Una Central Sulawesi

Dipta Tejo Nugroho^{1*}, Sepfrita Katerine Aftabuddin²

1) Hospital Management Student of Universitas Airlangga, Surabaya, Indonesia

2) Department of Pediatrics, Faculty of Medicine, Universitas Brawijaya, Malang, Indonesia

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**Correspondence:*

dr.dipta.nugroho@gmail.com

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ABSTRACT

Obesity has become a global health problem that strongly correlates with morbidity and mortality. Despite the importance of obesity, there remains a paucity of evidence on obesity among kindergarten children in Tonjouna, Central Sulawesi. Obesity in children is influenced by various factors, one of which is exclusive breastfeeding. This study aims to find the correlation between exclusive breastfeeding and obesity among children aged four to six years in three kindergartens in Una-Una. The study uses a cross-sectional design involving all children at this kindergarten. Anthropometric measurement was carried out in school before questionnaires were distributed to determine the number of breastfeeding given to the children. The data analysis revealed that 25% of children suffer from obesity. Five out of 68 children or 29.4% of those who get exclusive breast milk suffer from obesity. The statistical analysis using the Chi-square test shows a p-value of 0.002 ($p < 0.05$), which means that exclusive breastfeeding correlates with obesity in children aged four to six years. This is rather disappointing that the percentage of obesity is relatively high. Hence, educating parents and schools about the causes, risks, and ways to prevent obesity is necessary.



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INTRODUCTION

Obesity is an increasingly important issue in global public health. WHO reported that obesity in children has been increasing over the last decade (Skinner *et al.*, 2018). It is estimated that more than 100 million people are suffering from obesity. Patients with obesity have a higher possibility of experiencing morbidity and mortality than those with average weight. In a study from Liendsberg *et al.*, obesity in childhood increases the risk of mortality in early adulthood compared to the general healthy population (Lindberg *et al.*, 2020). Therefore, this condition needs special attention. Rachmi and Baur had conducted a study examining the prevalence of obesity in children and adolescent in Indonesia. The prevalence of obesity in children was 5,1%, while in Central Jawa province, the prevalence of obesity was higher in non-poor urban children compared to rural and poor urban children (Rachmi, Li and Alison Baur, 2017).

One of the risk factors for childhood obesity is a lack of exclusive breastfeeding (Wallby, Lagerberg and Magnusson, 2017). A prior systematic review study reported that infants exclusively breastfed for six months are less likely to suffer from obesity. Breastfeeding provides adequate physical growth and a lower risk of gastrointestinal infection (Frank *et al.*, 2019) Palaska's study shows that the percentage of children with normal weight was higher in those who were breastfed for over six months or received exclusive breastfeeding. While the percentage of underweight and overweight children was lower in those, who got exclusive breastfeeding (Palaska *et al.*, 2020). A meta-analysis study stated that out of 17 studies have reported significant protective factors against obesity in children (Yan *et al.*, 2014a).

There has been limited study of risk factors of obesity in children based on age groups,

specifically in Indonesia. Most studies focused on modifiable determinants and the driving factors of obesity and overweight. However, most studies are not concerned with the effect of obesity on specific age groups of children. We aimed to fill this gap in the literature on the correlation between exclusive breastfeeding and obesity among children aged four to six in Indonesia. We hypothesized a correlation between a lack of exclusive breastfeeding and a higher risk of obesity in children aged four to six years in Tojo Una-Una, Central Sulawesi.

METHODS

This cross-sectional observational survey study was fielded from June to October 2017. We include the data from three kindergartens in Una-una, Central Sulawesi. Most of the people in this area are farmers, including mothers of childbearing age. It causes most women in this area not exclusively breastfeed their children. The Ethics Committee has approved this study with ethical clearance number 319/HRECC. FODM/VI/2022.

Population and research samples

This study's population was all Una-una Kindergarten students in Central Sulawesi. A simple random sampling method was used to select the research participants. Using the formula of large samples, we obtain that the minimum number of samples is 68 children. In addition, selected subjects' mothers are also involved in the study. The first inclusion criteria in this study were children aged four to six years who are students from Al-Ikhlas Una-una Kindergarten, Central Sulawesi. Furthermore, the other criteria were mothers and their children willing to participate in this study based on informed consent. Children and mothers who are unwilling to participate in this study and children who suffer from chronic diseases (tuberculosis, chronic diarrhea, diabetes mellitus, chronic liver disease, kidney disease,



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Chronic hypothyroidism, or hyperthyroidism based on a physician's diagnosis) are excluded from the study.

Research instruments

The instrument used in this study was a questionnaire distributed to the children and then collected for analysis. The questionnaires comprised the explanation of the study and informed consent. In addition, the questionnaires were used to document the patient's demographic data and exclusive breastfeeding records. Breastfeeding is considered exclusive if it is given for six whole months. When it is only given less than six months, it is categorized into non-exclusive breast milk. The study used a digital scale with a precision of 0.1 kg to measure a child's weight, a Microtoise with a precision level of 0.1 cm to measure their height, a calculator to calculate the body mass index as well as the growth curve of the CDC 2000 Body Mass Index -for- percentile (Kuczmarski *et al.*, 2000).

Variable measurement

To ensure accuracy, the researcher utilized a digital bathroom scale set on a flat platform. Before the weight measurement, children were asked to take off their shoes, hat, and all objects on their bodies that may influence the scale. The child's position was perpendicular with a straight look forward and feet stepping on the scale. Afterward, the researcher read the numbers that appeared on the scale. The height measurement utilized OneMed Microtoise placed on a flat, two-meter wall. The lowest point, 0 (zero), was located at the lowest position on the ground. Children were measured without shoes and head coverings (ribbons used by girls will be removed if it affects the measurement). Then, the children stood upright with straight legs, and their heels, back, buttocks, and back of the head should touch the wall with the eye should be straightforward. The researcher lowered the Microtoise precisely on the children's upper

head while the elbow should be straight, touching the wall. The researcher read the scale numbers in the Microtoise, representing the students' height.

The child's age was calculated by subtracting the child's date of birth from the data collection date. If the number of days is less than 15, it is rounded down and rounded up if it is more than 15 days. Parents or school caregivers filled out the shared questionnaires. Children's obesity was determined using the 2000 CDC growth curve based on anthropometric measurements (Kuczmarski *et al.*, 2000).

Statistical analysis

Data was presented in the form of categorical data scales. The collected data were processed by following the process of editing, verification, and number (coding) answer questions. Furthermore, the data were converted into numbers, input into SPSS 21.0 software, and tested using Chi-square tests. The p -value < 0.05 was considered statistically significant.

RESULTS

A total of 68 children met the study's inclusion criteria. There were 40 male children, which comprised 59% of the sample. Children who receive exclusive breastfeeding are 43 (63%). Afterward, there are 45 children (66.2%) with normal Body Mass Index (BMI), consisting of 26 boys (38.2%) and 19 girls (27.9%). Children with an overweight BMI are six (8.8%), consisting of two boys (2.9%) and four girls (5.9%). Children with BMI obesity grade I are 11 children (16.2%), consisting of nine males (13.2%) and two females children (2.9%). Nevertheless, children with BMI obesity grade II are as many as six children (8.8%), consisting of three males (4.4%) and three females (4.4%). Patient characteristics related to the measurement can be seen in **Table 1**.

Twenty-five out of the 68 children involved



Table 1. Demographic and BMI characteristic of subjects in this study

Demographic Characteristic n (%)	Value	
Gender		
Male	40 (59%)	
Female	28 (41%)	
Breastfeed		
Exclusively breastfed	43 (63%)	
Non-exclusively breastfed	25 (37%)	
	Male	Female
	n (%)	n (%)
Normal BMI	26 (38.2%)	19 (27.9%)
Overweight	2 (2.9%)	4 (5.9%)
Obesity grade I	9 (13.2%)	2 (2.9%)
Obesity Grade II	3 (4.4%)	3 (4.4%)

Table 2. Chi-square statistical analysis

Breastfed history	Abnormal BMI n (%)	Normal BMI n (%)	Total n (%)	p-value
Non-exclusively	12 (70.6)	13 (25.5)	25 (36.85)	0.002
Exclusively	5 (29.4)	38 (74.5)	43 (63.23)	
Total	17	51	68	

in the study were given non-exclusive breastfeeding. 11 of them (16.2%) had normal BMI, two (2.9%) were overweight, eight (11.8%) were categorized to obesity grade I, and four (5.9%) were categorized to obesity grade II. Meanwhile, 43 children who are exclusively breastfed show different BMI. Thirty-four children (50%) perform normal BMI, four of them (5.9%) have overweight BMI, three children (4.4%) with BMI obesity grade I, and two children (2.9%) with BMI obesity grade II.

The correlation analysis of exclusive breastfeeding with the incidence of obesity using the Chi-square test shows that $p = 0.002$ ($p < 0.05$). This result means that a lack of exclusive breastfeeding leads to obesity in

children aged four to six. Therefore, it concludes that non-exclusive breastfeeding affects the possibility of obesity in children.

DISCUSSION

This study's percentage of obesity incidence is 25%, much higher than the percentage of obesity results of the 1999 Indonesian National Health Survey, which is 4.58%. It can happen due to the significant differences in the samples used in this study. Here, the study subjects were taken in Una-Una area, an area with a majority of the booming population, while in the 1999 Indonesian National Health Survey, the subjects used came from all over Indonesia.

The percentage of obesity incidence also shows



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an increase in private elementary school, overweight (17%) and obesity by 30.75% in South Jakarta (Annisa and Sumartini, 2021). A study in Iran also showed the prevalence of overweight by 19.7%. In that study, exclusive breastfeeding were not correlated with childhood BMI (Vafa *et al.*, 2012). Overweight in children of elementary school might due to various nutritional problems Those studies were conducted in elementary school, while this study was conducted in kindergarten. Therefore, the subjects studied have different age characteristics. Elementary school children are exposed to various foods sold in school more than kindergarten children (Welker, Lott and Story, 2016). More than that, elementary school children spend longer time in school than kindergarten children.

Risk Factors of Breastfeeding

Based on research in developed countries, the relationship between obesity and breastfeeding is still controversial. Some studies show protective effects, while others have found no difference. The researchers calculate and use *odds ratios* and show that the more children are not given exclusive breastfeeding, the greater the incidence of obesity. The incidence of obesity in children with exclusive breastfeeding is 29.4% and increases to 70.6% in children with non-exclusive breastfeeding. We consider the confounding and bias in this study as we know that other risk factors contribute to obesity. We excluded children with chronic diseases to avoid bias and control the confounding factors.

Exclusively breastfed children have 7.015 times fewer obese risk factors than non-exclusively breastfed children. Exclusive breastfeeding prevents obesity 0.143 times compared to children who are not exclusively breastfed. In other words, exclusive breastfeeding can prevent obesity. Another meta-analysis study stated that breastfeeding is inversely correlated with the incidence of obesity in children aged

from two to six years (Qiao *et al.*, 2020).

Weight gain occurs more precisely in babies who are given instant milk because of the tendency of parents to force their babies to drink milk in a bottle at once. Parents tend not to decrease the quantity of milk given even though the baby has consumed other foods than milk. Infants exclusively breastfed can control input energy, and exclusive breastfeeding does not contain sugar or additional fat (*trans-fat*). Cheshmeh stated that some genes increase body weight, including FTO, CPT1A, and PPAR- α genes. Expression of these genes was found to be lower in those who got exclusively breastfeeding compared to formula-fed and mix-fed children. In addition, infant's formula milk contains high levels of branched-chain amino acids (BCAAs) and glutamine that increase gene expression (Cheshmeh *et al.*, 2020).

The results of this study correspond with Sulanto (2012) in Indonesia, and Wang (2017) in the United States. The studies, as mentioned earlier, show that breast milk has a protective effect on the incidence of obesity and *overweight* (Sulanto, Wandita and Julia, 2012; Wang *et al.*, 2017). Similar with a study by Yan in 2017, an American study finds an inconsistent relationship between breastfeeding, duration, and risk factors for *overweight* children (Yan *et al.*, 2014b). However, unlike research conducted by Li in 2003 that shows a tendency to increase the risk of obesity incidence, these results do not have a significant statistical percentage (Li, 2003).

The results of research conducted both abroad and domestically showed different results. It may happen because the research subjects used as comparisons by researchers have different characteristics, namely subjects from developing and developed countries. Therefore, it is important for mothers during pregnancy to study the identification of the development of



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newborn risks in place early action to prevent childhood obesity in the future (Thibault *et al.*, 2022).

This study uses a *cross-sectional* design, so it becomes the study's limitation. This design cannot analyze the causal relationship between the two variables. In addition, there is no Validity Test and Reliability Test in this study because it does not use questionnaires on the Likert scale (Joshi *et al.*, 2015).

CONCLUSION

There is a correlation between exclusive breastfeeding and obesity in children aged four to six years. Children given exclusive breast milk have a seven times lower risk of obesity than those given non-exclusive breast milk. Further research is needed with a larger sample. We hope that the upcoming research can determine how much the percentage of obesity increases and detect excessive weight gain early.

REFERENCES

- Annisa, F. and Sumartini, E. (2021) "Overweight And Obesity Children In Private Elementary School Of South Jakarta," *JURNAL KEPERAWATAN CIKINI*, 2(1). doi:10.55644/jkc.v2i1.52.
- Cheshmeh, S. *et al.* (2020) "Effects of Breastfeeding and Formula Feeding on the Expression Level of FTO, CPT1A and PPAR- α Genes in Healthy Infants," *Diabetes, Metabolic Syndrome and Obesity: Targets and Therapy*, Volume 13, pp. 2227–2237. doi:10.2147/DMSO.S252122.
- Frank, N.M. *et al.* (2019) "The relationship between breastfeeding and reported respiratory and gastrointestinal infection rates in young children," *BMC pediatrics*, 19(1), p. 339. doi:10.1186/s12887-019-1693-2.
- Joshi, A. *et al.* (2015) "Likert Scale: Explored and Explained," *British Journal of Applied Science & Technology*, 7(4), pp. 396–403. doi:10.9734/BJAST/2015/14975.
- Kuczmariski, R.J. *et al.* (2000) "CDC growth charts: United States.," *Advance data*, (314), pp. 1–27.
- Li, L. (2003) "Breast feeding and obesity in childhood: cross sectional study," *BMJ*, 327(7420), pp. 904–905. doi:10.1136/bmj.327.7420.904.
- Lindberg, L. *et al.* (2020) "Association of childhood obesity with risk of early all-cause and cause-specific mortality: A Swedish prospective cohort study," *PLOS Medicine*, 17(3), p. e1003078. doi:10.1371/journal.pmed.1003078.
- Palaska, E. *et al.* (2020) "Association Between Breastfeeding and Obesity in Preschool Children," *Materia Socio Medica*, 32(2), p. 117. doi:10.5455/msm.2020.32.117-122.
- Qiao, J. *et al.* (2020) "A Meta-Analysis of the Association Between Breastfeeding and Early Childhood Obesity," *Journal of Pediatric Nursing*, 53, pp. 57–66. doi:10.1016/j.pedn.2020.04.024.
- Rachmi, C.N., Li, M. and Alison Baur, L. (2017) "Overweight and obesity in Indonesia: prevalence and risk factors—a literature review," *Public Health*. Elsevier B.V., pp. 20–29. doi:10.1016/j.puhe.2017.02.002.
- Skinner, A.C. *et al.* (2018) "Prevalence of Obesity and Severe Obesity in US Children, 1999–2016," *Pediatrics*, 141(3). doi:10.1542/peds.2017-3459.
- Sulanto, A., Wandita, S. and Julia, M. (2012) "Breastfeeding and decreased risk for childhood obesity," *Paediatrica Indonesiana*, 52(1), p. 1. doi:10.14238/pi52.1.2012.1-5.



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- Thibault, H. *et al.* (2022) “Prévalence à la maternité des facteurs de risque de développer une obésité infantile,” *Bulletin de l’Académie Nationale de Médecine*, 206(3), pp. 331–342. doi:10.1016/j.banm.2021.09.017.
- Vafa, M. *et al.* (2012) “Relationship between Breastfeeding and Obesity in Childhood,” *Journal of Health, Population and Nutrition*, 30(3). doi:10.3329/jhpn.v30i3.12293.
- Wallby, T., Lagerberg, D. and Magnusson, M. (2017) “Relationship Between Breastfeeding and Early Childhood Obesity: Results of a Prospective Longitudinal Study from Birth to 4 Years,” *Breastfeeding Medicine*, 12(1), pp. 48–53. doi:10.1089/bfm.2016.0124.
- Wang, L. *et al.* (2017) “Breastfeeding Reduces Childhood Obesity Risks,” *Childhood Obesity*, 13(3), pp. 197–204. doi:10.1089/chi.2016.0210.
- Welker, E., Lott, M. and Story, M. (2016) “The School Food Environment and Obesity Prevention: Progress Over the Last Decade,” *Current Obesity Reports*, 5(2), pp. 145–155. doi:10.1007/s13679-016-0204-0.
- Yan, J. *et al.* (2014a) “The association between breastfeeding and childhood obesity: A meta-analysis,” *BMC Public Health*, 14(1). doi:10.1186/1471-2458-14-1267.
- Yan, J. *et al.* (2014b) “The association between breastfeeding and childhood obesity: a meta-analysis,” *BMC Public Health*, 14(1), p. 1267. doi:10.1186/1471-2458-14-1267.