

ASSOCIATION BETWEEN BREASTFEEDING AND NUTRITIONAL STATUS IN CHILDREN WITH CONGENITAL HEART DISEASE AT DR. SOETOMO GENERAL HOSPITAL

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Abstract

Congenital heart disease (CHD) is a congenital condition caused by a lack of heart development during the fetal stage. There is a notion that children with CHD have low nutritional status due to their condition. Nutritional input, energy requirements, dietary components, and prenatal circumstances impact a person's nutritional status. An analytical observational design with a cross-sectional approach was used in this research. Data were obtained via medical records and questionnaires posed to the patients' guardians who had provided informed consent. The Chi-square test and multivariate logistic regression analysis were used to analyze the data. The study was conducted on 62 subjects. There were 74.19% of subjects with acyanotic CHD and 25.81% with cyanotic CHD. 61.29 % of the subjects were exclusively breastfed for the first six months. The Chi-Square test revealed a relationship between breastfeeding and the nutritional status of children with CHD, with $p = 0.0001$ ($p < 0.05$). The multivariate logistic regression analysis showed the significance of the type of CHD suffered by the subjects was 0.003 ($p < 0.05$). There is a significant association between breastfeeding for the first six months and the type of CHD suffered by children with their nutritional status at Dr. Soetomo General Hospital

Keywords: CHD; cyanotic; acyanotic; breastfeeding; nutritional status

Introduction

Congenital Heart Disease (CHD) is a congenital condition caused by a lack of heart development during the fetal stage (Ain, Hariyanto, & Rusdan, 2015). There are two types of CHD, cyanotic CHD and acyanotic CHD, each of which will show different symptoms and require other management (Djer & Madiyono, 2016). The precise cause of CHD is unknown. Several assumptions conclude that genetic alterations influence 20% of all CHD. The remaining 80% is caused by environmental factors, infections during pregnancy, and toxins throughout pregnancy (Lilly, 2012) (Widyastutik, 2021).

Assumptions have been made concerning the low nutritional status of children with CHD due to their illness. A person's nutritional status is determined by their nutritional input, energy needs, dietary components, and prenatal circumstances in addition to their health condition (Mitchell, Logan, Pollock, & Jamieson, 1995)

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(Wishnuwardhana, 2006) (Ekvall & Ekvall, 2017). Breast milk is a child's primary source of nutrients, especially in toddlers. Breast milk contains several nutrients that are beneficial for a child's growth and development (Widyastutik, 2021).

There has been little to no research in Indonesia, particularly in Surabaya, on the association between breastfeeding and the nutritional status of children with CHD, both cyanotic and acyanotic. As a result, this study aims to determine the association between breastfeeding and nutritional status in children with cyanotic and acyanotic CHD to help them maintain and even enhance their nutritional intake

Methods

This study used an analytical observational design with a cross-sectional approach by collecting data through medical records and questionnaires posed to the subjects' guardians. The ethics committee at Dr. Soetomo General Hospital granted ethical clearance for this study (No.0205/LOE/301.4.2/XI/2020). All cyanotic and acyanotic CHD patients aged 6-24 months at Dr. Soetomo General Hospital between January 2018 and January 2021 who met the criteria were included in this study. Children aged 6-24 months with CHD who came to the pediatric cardiac outpatient of Dr. Soetomo General Hospital; guardians who agreed to participate in this study by signing the informed consent; and children who had consumed milk, wither breast milk or formula milk, for at least the first six months of their life, were the inclusion criteria for this study. Children with CHD who also had Down syndrome, Turner syndrome, or cerebral palsy were excluded from this study. Sixty-two subjects met the criteria. Medical records were used to acquire information such as patients' ages, weights, and heights and the precise diagnosis of CHD and other illnesses suffered by the patients. The study continued by contacting the subjects' guardians to obtain information on the subjects' breastfeeding history.

Based on the Regulation of the Minister of Health of the Republic of Indonesia Number 2 of 2020 concerning Child Anthropometry Standards, the nutritional status of children with CHD was measured using the Z-score, which was further classified as severely wasted, wasted, normal, possible risk of being overweight, overweight, and obese. The Chi-square test was used to analyze the relationship between breastfeeding and the nutritional status of children with CHD. A multivariate logistic regression analysis was also conducted in this study to explore other variables that might affect the nutritional status of children with CHD. The tests mentioned above were run using IBM SPSS Statistics software version 25.

Results

Between January 2018 and January 2021, 62 subjects met the criteria and were willing to participate in this study, out of a total of 267 patients with CHD, both cyanotic and acyanotic. Acyanotic CHD was found in 46 (74.2%) subjects, while cyanotic CHD was found in 16 (25.8%). The most prevalent kind of acyanotic CHD was ASD, which affected 22 subjects (35.48%). At the same time, all cyanotic CHD

patients in this study were ToF patients, with as many as 16 (25.8%) subjects suffering from this condition.

Table 1
Characteristics by subjects' type of CHD

Type of CHD ^a	Freq (n = 62)	%
Acyanotic		
ASD	22	35.48%
VSD	15	24.19%
PDA	9	14.52%
Cyanotic		
ToF	16	25.81%

^aAbbreviation: ASD: Atrial Septal Defect, VSD: Ventricular Septal Defect, PDA: Patent Ductus Arteriosus, ToF: Tetralogy of Fallot.

With a total of 33 subjects (53.23%), males made up most of the subjects in this study, while females made up 29 subjects (46.77%)

Table 2
Characteristics by subjects' sex

Gender	Freq. (n = 62)	%
Male	33	53.23%
Female	29	46.77%

The majority of the research subjects, up to 38 subjects (61.29%), were provided exclusive breastfeeding for the first 6 months. For subjects who were not exclusively breastfed, 13 (20.97%) were given formula milk and 11 (17.74%) were given a mixture of breast milk and formula for the first 6 months. The type of formula milk administered to all research subjects is presumed to be the same in this study. Exclusive breastfeeding was provided to 19 of the subjects with ASD (30.65%), 11 of the subjects with VSD (17.74%), and 7 of the subjects with PDA (11.29%). Furthermore, only formula milk was provided to 9 of the subjects with ToF. It can be concluded that the majority of subjects with acyanotic CHD received exclusive breastfeeding, whereas the majority of subjects with cyanotic CHD had other intakes.

In subjects suffering from acyanotic CHD, 40 of them (64.52%) had normal nutritional status, 4 subjects (6.45%) had wasted nutritional status, and 2 subjects (3.23%) had severely wasted nutritional status. 8 patients suffering from cyanotic CHD had severely wasted nutritional status (12.9%), 7 had wasted nutritional status (11.3%), and only 1 subject with cyanotic CHD had normal nutritional status (1.61%). It can be stated that the majority of subjects with acyanotic CHD had normal nutritional status. Meanwhile, the majority of subjects with cyanotic CHD had poor nutritional status.

Table 3
Characteristics of subjects' nutritional status

Nutritional status	Acyanotic CHD		Cyanotic CHD	
	Freq. (n = 62)	%	Freq. (n = 62)	%
Severely wasted	2	3.23%	8	12.9%
Wasted	4	6.45%	7	11.3%
Normal	40	64.52%	1	1.61%
Possible risk of being overweight	0	0%	0	0%
Overweight	0	0%	0	0%
Obese	0	0%	0	0%

The Chi-square test results revealed a significant correlation between breastfeeding and nutritional status in children with CHD, with $p = 0.0001$ ($p < 0.05$). A multivariate logistic regression analysis was also performed to analyze the connection between other variables such as the type of CHD suffered, gender, surgery history, and history of comorbidities with the nutritional status of children with CHD. This analysis discovered a relationship between the type of CHD suffered by the subjects and their nutritional status with $p = 0.003$ ($p < 0.05$). In this study, the history of comorbidities was not specifically categorized.

Discussion

There were 46 subjects with acyanotic CHD and 16 subjects with cyanotic CHD among 62 research subjects. This demonstrates that the incidence of acyanotic CHD is higher than the incidence of cyanotic CHD, which is also in line with research from Tjan and friends back in 2020 (Tjan, 2020). The ToF defect was seen in all of the patients with cyanotic CHD in this study. ToF is the most common type of cyanotic CHD, occurring in 3 out of 10,000 births (Bailliard & Anderson, 2009) (Llamosas-Falcón et al., 2019).

Nutritional status can be used to assess a child's development, including in children with CHD, both cyanotic and acyanotic. A child's nutritional status can be influenced by a variety of factors. Exclusive breastfeeding is one of them (Nilakesuma, Jurnal, & Rusjdi, 2015). WHO and UNICEF also suggest that children be breastfed exclusively for the first six months of their lives, with no extra supplements. Breastfeeding is regarded as crucial for the first six months since it has a significant impact on children's health as well as their growth and development (Muchina & Waithaka, 2010). In this study, 38 subjects (61.29%) were found to have been exclusively breastfed for the first 6 months of their lives. 37 of 38 subjects who were breastfed exclusively for the first 6 months had normal nutritional status. In addition, 24 subjects were given an alternative to exclusive breastfeeding, either a combination of breast milk and formula milk or solely formula milk. There were 9 subjects with low nutritional status and 9 others with poor nutritional status among the 24 subjects. This is

in line with research conducted in Semarang, which found that children who are not exclusively breastfed are more likely to suffer from malnutrition (Ginanti, Pangestuti, & Rahfiludin, 2017). According to the results of the Chi-square test performed in this study, there was a strong association between breastfeeding during the first 6 months and the nutritional status of children with CHD, both cyanotic and acyanotic, with $p = 0.0001$ ($p < 0.05$).

Based on the findings of this study, children with acyanotic CHD tend to have better nutritional conditions than children with cyanotic CHD. This is consistent with studies published by Arodiwe and colleagues in 2015, which found that children with cyanotic CHD are malnourished. Malnutrition in children with cyanotic CHD is caused by a variety of factors, including insufficient dietary intake and increased body energy requirements due to an increase in the body's basal metabolism. Furthermore, malnutrition in children with cyanotic CHD can be induced by metabolic acidosis as a result of hypoxia, anorexia, and poor nutritional digestion at a cellular level (Afridi, Rasool, Tabassum, & Shaheen, 2015). When there is a heart lesion, the child will tend to ingest an excessive amount of fluid and sodium, which will interfere with the heart's hemodynamic function. This can result in cardiac decompensation, causing the child's intake to plummet. The work of the heart and respiratory organs are also increased as a result of this condition. Reduced intake combined with increased respiratory effort in children results in severe nutritional deficiencies, requiring 50% more calories than normal children to attain normal growth (Varan, Tokel, & Yilmaz, 1999) This study demonstrates that one of the main factors of a child's poor nutritional condition, aside from the intake received by the child, particularly during the first six months of life, is the type of CHD suffered by that child. This is supported by the findings of a multivariate logistic regression analysis, which reveals that the significance of the kind of CHD suffered by children is $p = 0.003$ ($p < 0.05$).

Conclusion

There is a substantial association between breastfeeding for the first six months and the type of CHD suffered by children with their nutritional status at Dr. Soetomo General Hospital.

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