

## THE EFFECT OF EXCLUSIVE BREASTFEEDING ON INFANT IMMUNITY STATUS THROUGH SICK BABY VISITS AT THE PUSKESMAS IN SUMBERJAYA VILLAGE

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### ABSTRAK

Jumlah keluhan kesehatan di Indonesia meningkat, terutama pada anak usia 0–4 tahun dengan prevalensi 37,40% (BPS, 2023). Persentase rawat inap pada balita juga tinggi, mencapai 5,10%. Salah satu pencegahan yang dapat dilakukan adalah pemenuhan gizi melalui ASI eksklusif pada bayi usia 0–6 bulan, yang mendukung sistem kekebalan tubuh secara optimal karena kandungan nutrisinya yang kompleks. Penelitian ini bertujuan untuk mengetahui pengaruh ASI eksklusif terhadap sistem kekebalan bayi dengan mengamati kunjungan bayi sakit di Puskesmas Desa Sumberjaya. Fokus penelitian adalah korelasi antara pemberian ASI eksklusif dan kekebalan bayi. Metode penelitian ini adalah kuantitatif deskriptif dengan pendekatan cross-sectional retrospektif. Data dikumpulkan melalui kuesioner dan pencatatan kunjungan bayi sakit di Puskesmas dengan responden bayi usia 0–12 bulan yang menerima ASI eksklusif selama 0–6 bulan. Data dianalisis menggunakan perangkat lunak Smart PLS 3 untuk mengidentifikasi korelasi antara pemberian ASI eksklusif dan status kekebalan bayi. Hasilnya menunjukkan hubungan signifikan antara pemberian ASI eksklusif dan status kekebalan bayi dengan nilai  $T < 1,65$  sebesar 0,979. Temuan ini menegaskan pentingnya ASI eksklusif dalam mendukung imunitas bayi usia 0–12 bulan, berkontribusi pada upaya meningkatkan kesehatan bayi di Indonesia.

**Kata kunci** : bayi, menyusui eksklusif, sistem kekebalan tubuh

### ABSTRACT

The number of health complaints in Indonesia has increased, especially in children aged 0 to 4 years. The percentage obtained from the Central Statistics Agency 2023 obtained includes high data, namely 37.40%. In addition, the number of hospitalisations has also increased with a high percentage, namely in toddlers aged 5.10%. This can be prevented by fulfilling children's nutrition through exclusive breastfeeding during the age of 0 months to 6 months. Exclusive breastfeeding is able to provide and improve the baby's immune system because breast milk has a complex nutritional content and affects the immune system at this time until the long term. Therefore, this study was conducted to determine the mechanism of breast milk on the body's metabolism so as to assess the effect of exclusive breastfeeding on the immune system of infants by looking at the visits of sick infants at the Sumberjaya Village Health Centre. This study will focus on the correlation between exclusive breastfeeding and the immune system in infants, especially at the Sumberjaya Village Health Centre. This study aims to determine and describe the prevalence of the effect of exclusive breastfeeding on the immune system of infants through sick baby visits at the Sumberjaya Village Health Centre. This study used descriptive quantitative research with a retrospective cross-sectional method. Data collection in this study uses questionnaires to collect primary data and visits to the Sumberjaya Village Health Centre with the required data, namely infant respondents aged 0 months to 12 months, exclusive breastfeeding at the age of 0 months to 6 months, and sick infant visits. The data will be analysed using Smart PLS 3 software to identify the correlation between exclusive breastfeeding and infant immune system. The results of this study indicate that there is a significant relationship between exclusive breastfeeding and infant immunity status with a  $T$  value  $< 1.65$  of 0.979. There is a relationship between exclusive breastfeeding and infant immune status. This study contributes to the study of the importance of exclusive breastfeeding for infants aged 0 months to 12 months.

**Keywords** : exclusive breastfeeding, immune system, infants

## INTRODUCTION

The immune system is the body's defence system or mechanism to prevent pathogens. Immunity comes from the word *immunis* which means free from burden. According to Irianto (2012), the immune system is a system that forms the body's ability to fight disease seeds by rejecting various foreign objects that enter the body in order to avoid disease. The immune system is categorised into two groups, namely innate immunity which is non-specific and acquired immunity or adaptive immunity system which is specific (Hidayat & Syahputra, 2020; Yi & Kim, 2021). Innate immunity has two layers of defence, namely external defence and internal defence (Nochi & Kiyono, 2006). External defence acts as the first layer in the form of physical, chemical, and biological barriers involving the skin, mucosa, cilia, sweat glands, tears, saliva, digestive enzymes, and bioflora. Internal defence as the second layer uses phagocytic cells, anti-microbial proteins, inflammatory responses and natural killer cells. Acquired immunity is adaptive and is needed when innate immunity is unable to prevent and protect against pathogens (Darwin et al., 2021).

The immune system has 3 main functions, namely as a defence, homeostasis, and surveillance. The immune system is also influenced by several factors, such as genetic, age, metabolic, environmental and nutritional, anatomical, physiological, and microbial. In humans, there are MHC (Major Histocompatibility Complex) genes that can determine susceptibility to disease (AlThuneyyan et al., 2022; Desty & Wahyono, 2021). Breast milk, as the best source of nutrition for infants, contains the nutrients that infants need (Gopalakrishna & Hand, 2020). Breast milk has a major effect on the immune system during growth and development, and can even have a long-term effect. In addition, breast milk also has an effect on motoric development, which can be linked to a child's intelligence. Breast milk consists of macronutrients and micronutrients (Lyons et al., 2020). The macronutrient components of HBM (Human Breast Milk) such as carbohydrate, fat, and protein amount to 65-70 kcal of energy per 100 mL (Kim & Yi, 2020).

Lactose as the main carbohydrate Lactose will be broken down and absorbed by the enzyme lactase-phorizin hydrolase (lactase), in the form of monosaccharides (glucose and galactose). Insufficient lactase causes lactose malabsorption and usually does not occur in exclusively breastfed infants. Lactose plays a role in the osmolality of HBM, in that the average lactose content increases significantly, from colostrum to transitional and mature milk, while maintaining a constant concentration in mature milk (Rohman et al., 2021). Breast milk contains proteins consisting of whey complexes or fractions and caseins that contain specific protein and peptide moieties. Whey protein contains mostly casein,  $\alpha$ -lactalbumin, lactoferrin, secretory immunoglobulin IgA, serum albumin, and lysozyme (Ballard & Morrow, 2013). Another study explained that there are several kinds of proteins, such as  $\alpha$ -lactalbumin,  $\beta$ -casein, folate binding protein, haptocorrin, lipase by bile salt stimulation, amylase, antitrypsin  $\alpha$ -1, and lactoferrin, with a content of 1% (8-10 g/L) of HBM and the highest content at the beginning of the baby's birth at 14-16 g/L which will decrease at 3 to 4 months to 8-10 g/L and after 6 months will decrease to 7-8 g/L.  $\alpha$ -lactalbumin forms lactose biosynthesis and helps the absorption of trace elements and minerals, such as calcium and zinc.  $\alpha$ -lactalbumin will bind to oleic acid so that it can form a complex as human  $\alpha$ -lactalbumin to kill tumour cells (HAMLET) by inducing tumour apoptosis and activating ion fluxes to different cellular compartments and can treat oncological diseases.

HBM contains cytokines, such as Tumour Necrotic Factor- $\alpha$ , interferon- $\gamma$ , interleukin (il)-1 $\beta$ , IL-6, IL-8, IL-10, Transforming Growth Factor- $\beta$ , helps immunomodulation and passive protection, to reduce infection. The action of lysozyme with lactoferrin will inhibit pathogenic bacteria (such as Gram-negative bacteria). Lactoferrin is an iron-binding glycoprotein that supports the immune system. The highest level of lactoferrin can be found in colostrum at 7

ng/L and decreases gradually to 2-4 ng/L in mature milk. Secretory IgA (SIgA) and SigG are immunoglobulins contained in milk with high concentrations and play a role in the immune system of newborns. SIgA with concentrations of up to 12 mg/mL in colostrum prevents pathogens on the surface of epithelial cells and can neutralise toxins. Fats can affect the growth and development of the baby's central nervous system. Long-chain polyunsaturated fatty acids (LCPUFAs) affect the development of the baby's retina and brain cortex. Sphingomyelins can also affect the myelination of the central nervous system in neurobehavioral effects. HBM contains 3.5-4.5%, in the form of 95-98% in the form of triglycerides, which is influenced by the mother's diet, weight changes during pregnancy, and breast fullness at the last feeding. Short chain fatty acids in HBM can support infant growth and play a role in gastrointestinal maturation.

Breast milk contains micronutrient components that depend on the mother's diet, such as vitamins A, B1, B2, B6, B12, D, and non-protein nitrogen-containing compounds, such as sodium, potassium, magnesium, and zinc (Guo & Hendricks, 2008). Minerals are required in the metabolic process in infants, such as zinc which is used as a limiting reagent for the proliferation of various types of gut bacteria. In addition, breast milk also contains HMO (Human Milk Oligosaccharides) which are resistant to hydrolysis in the neonatal small intestine. HMOs are also used as prebiotics and metabolic substrates that support the growth of beneficial gut bacteria, such as *Bifidobacterium*. The World Health Organization (WHO) recommends that all infants should be exclusively breastfed (i.e. receive only breast milk and no other food or drink) for the first 6 months of life to achieve optimal growth and development and health. Infants should receive complementary foods from 6 months, while breastfeeding should continue for up to 2 years (Van Dellen et al., 2019). At present, the fulfilment of exclusive breastfeeding for infants has increased significantly.

The highly complex content of breast milk is instrumental in infant growth and development. Exclusive breast milk contains anti-inflammatory, immunomodulatory and antimicrobial components that can influence cognition and psychomotor development in children (Saraha & Umanilo, 2020; Umami & Margawati, 2018). This can be proven by the content of breast milk that can support special growth factors such as epidermal growth factors, to help heal the intestinal mucosa, insulin-like growth factors (IGF) 1 and 2 to promote tissue growth, and nerve growth factors that help peristalsis, as well as several growth factors that improve infant development (Sánchez et al., 2021). The Central Bureau of Statistics shows a graph of the percentage of children who have health complaints in the last month by province in 2020-2022 has increased (13.55%) between 2021-2022. This can lead to disruption of daily activities. According to the March 2020-2022 susenas, the percentage of children who have been hospitalised in the past year shows a graph that has decreased significantly. Based on the type of region, urban areas (2.15%) show a higher graph than rural areas (1.53%) and the most places of hospitalisation are in private hospitals at 42.31%.

This study aims to determine the effect of exclusive breastfeeding on the baby's immune system by observing visits to sick babies at the Sumberjaya Village Health Center. The focus of the study is the correlation between exclusive breastfeeding and infant immunity.

## METHOD

This study was conducted with a descriptive quantitative research model with a retrospective cross-sectional method, namely research conducted by taking existing data and collecting data at one time. The research was conducted in the working area of the Sumberjaya Village Health Centre on 19 July to 31 July 2024. Therefore, this study requires primary and secondary data, namely primary data to collect the reasons for infant illness (whether caused by not fulfilling exclusive breastfeeding) and secondary data to collect data on the number of sick

infant visits at the Sumberjaya Village Health Centre. Primary data collection was conducted by filling out questionnaires by respondents. In addition, secondary data collection was carried out by visiting the Sumberjaya Village Health Centre. The study used several variables, namely exclusive breastfeeding which acts as an independent variable and the status of the infant's immune system as the dependent variable with the factors of maternal disease, congenital disease, and frequency of breastfeeding as confounding variables. The instrument used was a questionnaire distributed to respondents.

This study was conducted on a population of all breastfeeding mothers and infants aged 0 months to 12 months in the working area of Puskesmas Sumberjaya Village as many as 418 people. Sample selection using simple random sampling and after being entered into the Slovin formula obtained a sample size of 204 people with a confidence level of 95%.

## RESULT

This study was conducted in the area of Sumberjaya Village Health Centre for 10 days. The study was conducted on 204 respondents of breastfeeding mothers and infants aged 0 months to 12 months with the inclusion criteria being infants aged 0 months to 12 months, both in good health and sick infants but without congenital disease and healthy breastfeeding mothers, either exclusively breastfeeding or not exclusively breastfeeding. In the exclusion criteria, the excluded data were sick infants with a history of congenital or congenital diseases and sick breastfeeding mothers, such as having congenital or congenital diseases at birth or those who are sick who are worried that they can pass on the disease to their babies. The following are the results of data analysis after tabulating data derived from respondents' answers to the questionnaire.

**Table 1. Missing, Mean and Median**

	No	Missing	Mean	Median
X1	1	0	0.484	0.000
X2	2	0	0.445	0.000
Y1	3	0	0.458	0.000
Y2	4	0	0.600	1.000

In table 1, there is a 'No' column, which is the order of each variable. The 'Missing' column is used to determine whether or not there is missing data and in the figure all variables are 0 so it can be concluded that there is no missing data. In addition, there is also a mean value on each variable X1 = 0.484; X2 = 0.445; Y1 = 0.458; and Y2 = 0.600; median on variables X1 = 0.000; X2 = 0.000; Y1 = 0.000; Y2 = 0.000.

**Table 2. Path Coefficients**

	Exclusive Breastfeeding	Infant Immunity Status
Exclusive Breastfeeding	-	0.164
Infant Immunity Status	-	-

In table 2, it can be found that the number in the middle is the value of the path coefficient, which is 0.164. This shows that the data has a strong correlation between each latent variable. To determine the validity and reliability of the variables as indicators of exclusive breastfeeding and infant immunity status, the figure above shows that the loading factor is more than 0.5 so that it can be declared valid. Therefore, it can be concluded that the path coefficient shows a correlation between exclusive breastfeeding and infant immunity status.

The significance of a data can be seen from the T statistics value. Based on the T statistics value, the effect of exclusive breastfeeding on infant immunity status is significant because it

has a value below 1.65, which is 0.979.

**Table 3. T Statistics**

	T Statistics
Exclusive Breastfeeding -> Baby's Immunity Status	0.979

## DISCUSSION

Research on the Effect of Exclusive Breastfeeding on Infant Immunity Status through Sick Infant Visits at the Sumberjaya Village Health Centre was conducted using a research method by collecting data using a questionnaire to obtain primary data and visiting the Sumberjaya Village Health Centre to obtain secondary data. Primary data required was information on exclusive breastfeeding from the baby's mother. Secondary data were collected through medical records and visits of sick infants at the Sumberjaya Village Health Centre. The sample in this study amounted to 204 derived from the population of infants aged 0-12 months from each posyandu under the auspices of the Sumberjaya Village Health Centre of 418 and the number was processed into the Slovin formula so that the number 204 was obtained. The 418 sample data came from e-pgbr data (Community Based Nutrition Recording and Reporting application). Of the 204 samples obtained, data were excluded so that the total data analysed was 155. Based on the primary data obtained, there were several answers from mothers who still did not understand what exclusive breastfeeding meant so there were several other answers that could help researchers to make conclusions from the answers obtained. Therefore, before the data is analysed, data cleansing is required.

Based on the data analysis above, it can be concluded that exclusive breastfeeding is very influential on the immune status of infants because exclusive breastfeeding is the best nutrition that is needed by infants. Breast milk contains protein consisting of whey complex or fraction and casein, each component of which consists of specific protein and peptide composition. The most abundant whey proteins are casein,  $\alpha$ -lactalbumin, lactoferrin, secretory immunoglobulin IgA, serum albumin, and lysozyme. In this study, the frequency of frequent sickness, infrequent sickness, or even never sickness was seen through visits to health care facilities, such as health centres. However, sick baby visits are influenced by various factors, such as maternal education and knowledge and maternal attitudes, where knowledge and education will increase the mother's understanding of the importance of visiting a health care facility when the baby is sick so that quick treatment can be given. Prompt and appropriate treatment can reduce the risk of death so as to reduce the mortality rate of infants and toddlers due to malnutrition.

However, the success of exclusive breastfeeding can be influenced by various factors including maternal education, economy, and lifestyle. The mother's education level is very influential on the success of exclusive breastfeeding because the higher a person's education, the easier it is to understand and obtain information. This was found based on primary data, there were several mothers who had a limited level of education who did not understand what exclusive breastfeeding meant and when traced in the baby's medical record often visited because of illness. To the Sumberjaya Village Health Centre. Families who have problems in economic status will affect the success of exclusive breastfeeding because mothers have to work. Working mothers have a 3.7 times greater risk of not exclusively breastfeeding than non-working mothers. The busyness of working mothers causes them to prefer formula milk as the first choice to replace breast milk. In addition, economic problems can also affect the mother's lifestyle such as the fulfilment of maternal nutrition because the nutritional status of breastfeeding mothers will affect the quantity and quality of breast milk. The nutritional status of mothers can be seen from the mother's BMI which can show the fat stores needed for breastfeeding.



## CONCLUSION

Based on the data analysis test on path coefficients, there is a strong correlation between the effect of exclusive breastfeeding on infant immunity status. This is also reinforced by the results of data analysis from the statistical T test, namely the significance of the value of these variables.

Future research is expected to be able to monitor factors influencing exclusive breastfeeding such as the birthing process and place of birth that can affect the success of lactation and IMD (Early Breastfeeding Initiation) between mother and baby. Lactation is the process of the baby sucking and breastfeeding through the nipple of the mother's breast. Successful lactation will affect the success of exclusive breastfeeding. In addition, it is hoped that there will be support from the government to discipline regulations on the obligation of mothers to provide exclusive breastfeeding without medical indication, absence of the mother, or separation of the mother from the baby, as described in Government Regulation No. 33/2012 articles 6 and 7; support from health workers and the community to support the success of exclusive breastfeeding.

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