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# History of Infectious Diseases and History of Basic Immunization Status: Stunting Incidence in Toddlers

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***ABSTRACT***

*Toddler is a term used to refer to children up to the age of five. Children who are still in the toddler stage are very dependent on their parents in carrying out their daily activities. The toddler period is a crucial period in the child's growth and development process. One of the nutritional problems that often occurs in toddlers is stunting, which is a condition where the child's height is lower than the average height of children of the same age. The purpose of this study was to determine the relationship between infectious disease history and basic immunization status history with stunting incidence at Limboto Health Center, Gorontalo Regency. This study is a non-experimental quantitative study with a cross-sectional design using a retrospective analysis approach. Sampling in this study was carried out using the Non Probability Sampling Technique, namely the Purposive Sampling Technique. with a population of 2,895 respondents and a sample of 96 respondents, the chi-square test using the SPSS program obtained a p-value (0.000) smaller than α = 0.05 or p-value <α value so that it can be concluded that H1 is accepted, meaning that there is a relationship between a history of infectious diseases and the incidence of stunting in the Limboto Health Center work area. In conclusion, there is a relationship between a history of infectious diseases and a history of basic immunization status with the incidence of stunting at the Limboto Health Center, Gorontalo Regency. Therefore, this study is expected to provide useful information for the implementation of the stunting program at the health center and help achieve the program's final goals.*

## 1. INTRODUCTION

Toddlers are a common term for children up to five years old. Children aged 1 to 3 years are categorized as toddlers, while children aged 3 to 5 years are included in the preschool group. At the toddler stage, children are very dependent on the help and guidance of their parents in carrying out their daily activities. The toddler period is a very decisive period in the process of child growth and development, because an important foundation for the next stage of development is formed during this period. Therefore, this period is often referred to as the "golden age", which is unique and will not be repeated throughout the child's life. Common nutritional problems in toddlers include Protein Energy Deficiency (PED), Vitamin A Deficiency (KVA), Iron Nutritional Anemia (AGB), Iodine Deficiency Disorders (KAKY), and over-nutrition. One form of chronic nutritional disorder in toddlers is stunting, which is characterized by a shorter body posture than children of the same age. Toddlers who experience growth retardation are at risk of experiencing delays in achieving optimal physical and cognitive development (Dewi, 2022).

Stunting is one of the nutritional problems experienced by many children in various parts of the world today. (Yusuf, 2024). Stunting is a growth condition characterized by a child's height being lower than the standard for their age, which occurs chronically since the early stages of growth and development of life. Khairani, (2020). Stunting, also known as dwarfism, is a condition experienced by toddlers with shorter body postures compared to children of the same age. This condition is generally caused by a lack of nutritional intake that occurs in the long term, especially during the first 1,000 days of life. Toddlers are categorized as experiencing stunting if their height or length does not match the growth standards based on their age. The high prevalence of stunting among toddlers in various countries shows that this problem is still a major challenge in the field of

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child nutrition globally.(Adjid, 2024). Stunting is a condition of physical growth failure characterized by height below the age standard, namely with a Z-score value of less than -2 standard deviations. This condition is often used as an indicator to assess child growth and reflects chronic malnutrition. Stunting is included in the category of long-term nutritional disorders that have an impact on the child's growth and development process. In addition to malnutrition, infections that often occur in children are also a factor causing stunting. The impact of stunting is permanent or irreversible, so that it interferes with the child's overall growth and cannot be repaired later on (Wulansari, 2024).

The impacts of stunting can be classified into short-term and long-term. In the short term, stunting can cause physical growth retardation, impaired cognitive and motor development, body size that is not in accordance with age, and disorders of the metabolic system. Meanwhile, the long-term impacts of stunting include decreased intellectual ability. Disturbances in cognitive and motor function can also reduce a child's ability to absorb lessons when entering school age, which ultimately has an impact on the level of productivity as an adult (Primasari, 2020). According to the World Health Organization (WHO), the total number (prevalence) of stunting (undernourished babies) in certain regions of the world in 2020 was 22% or 149.2 million people. According to the Asian Development Bank, in 2022 the proportion of children under the age of five will reach 31.8%. This figure places Indonesia in 10th place in the Southeast Asia region. Moreover, the stunting rate in Indonesia will drop to 21.6% in 2022, according to the Ministry of Health.

The results of the 2023 SKI show that data per province shows disparities between regions, with the lowest stunting prevalence at 7.2% and the highest at 37.9%. Of the 38 provinces in Indonesia, 18 provinces have stunting rates above the national average, including Gorontalo which increased by 26.9% compared to 23.8% with the results of the SSGI in 2022Ministry of Health of the Republic of Indonesia, (2023). Gorontalo Province has a high stunting rate and is estimated to rank 17th out of all provinces in Indonesia in 2022 with a stunting rate of 23.8%. This number is still high compared to the national prevalence rate of 21.6%. However, the prevalence in Gorontalo Province has decreased by 5.2% since 2021 (Coordinating Ministry for Human Development and Culture of the Republic of Indonesia, 2023).

Based on the results of the 2022 Indonesian Nutritional Status Survey (SSGI), which showed that the incidence of stunting in Gorontalo was 23.8 percent. If we look deeper, the stunting data in Gorontalo shows that Gorontalo Regency has the highest stunting rate. The incidence of stunting in Gorontalo Regency was 30.8 cases in 2022. This figure is slightly higher than Boalemo Regency at 29.9. Next is North Gorontalo Regency with a percentage of 29.3. In addition, Bone Bolango Regency controls 22.3%. Moreover, the stunting rate in Gorontalo City is 19.1 percent, while the lowest is in the westernmost province of Gorontalo, Pohuwato Regency, which is only 6.4 percent (Gorontalo Tribune, 2023).

Based on initial data collection conducted at the Gorontalo Provincial Health Office. The results of the 2023 Indonesian Health Survey, the district with the highest prevalence of stunting is Gorontalo Regency at 34.7%. Based on this data, the first data collection will then be conducted at the Gorontalo Regency Health Office. Based on initial data collection on stunting incidents in 2023, the number of children with the highest incidence of stunting was 1,315 children, with details at the Limboto Health Center with 193 toddlers, followed by the Tilango Health Center with 127 toddlers, Tabongo Health Center with 124 toddlers, Batudaa Pantai Health Center 100 toddlers and in 5th place the West Limboto Health Center with 97 toddlers.

Based on the results of initial data collection at the Limboto Health Center. The highest incidence of Stunting in Gorontalo Regency with a total of 2,895 toddlers and according to nutrition officers, data from July 2024 showed that the number of stunted toddlers was 193 toddlers spread across 14 sub-districts throughout Limboto District. In 2023, the prevalence of stunting at the Limboto Health Center was still very high, at 5%. Due to the high incidence of stunting, great attention is needed to resolve the problem of stunting in 2024.

Causes of stunting include medical history and basic immunization status. Children who experience stunting are more susceptible to health problems such as infections and are at risk of experiencing cognitive quality disorders.(Roesardhyati, 2021).Infectious diseases are one of the

direct causes of stunting. Infections can reduce a child's appetite, so that food intake is insufficient. In addition, nutrients that enter the body are not used to support growth, but are used by the body to fight infection. When the body is sick, the need for nutrients actually increases to help the healing process (Khairani, 2020). Infectious diseases primarily affect the nutritional status of children under 5 years of age and can disrupt linear growth. This occurs because infections can reduce food consumption, disrupt the process of nutrient absorption, cause direct nutrient loss, and increase the body's metabolic needs.Eve, (2020). In addition to a history of infectious diseases, toddlers with a history of incomplete basic immunization are at risk of stunting.

Immunization is an effort to form immunity against disease. This action plays an important role in reducing morbidity and mortality in children. In addition, immunization also helps maintain children's nutritional conditions and prevent malnutrition (Khairani, 2020). Immunization is a method of actively providing immunity to protect a person from infectious diseases. The main goal of immunization is to reduce the number of illnesses, disabilities, and deaths caused by diseases that can actually be prevented. Immunity obtained from immunization is very important, especially in early life, because young children are included in the group that is vulnerable to various infections. The high frequency of infection at this age can have an impact on malnutrition. In addition to immunization, exclusive breastfeeding, diet, how food is served, and food sanitation also play an important role in preventing stunting (Evy, 2020).

The achievement of the stunting prevalence target set by the World Health Assembly (WHA) targets a reduction in stunting rates by 40% from the 2013 figure, which was 22%, by 2025. Meanwhile, the Sustainable Development Goals (TPB) target the elimination of all forms of malnutrition by 2030. In response to this, the government has set stunting control as one of the national priority programs. In the Regulation of the Minister of Health of the Republic of Indonesia Number 39 of 2016 concerning Guidelines for the Implementation of the Healthy Indonesia Program with a Family Approach, it is explained that the steps taken to reduce stunting rates in toddlers include growth monitoring, implementation of the Supplementary Feeding (PMT) program, stimulation of toddler development from an early age, and provision of optimal health services (Agung, 2020).

## 2. METHOD

This study was conducted at the Limboto Health Center, Gorontalo Regency on December 10, 2024 - January 6, 2025. This study is a non-experimental quantitative study with a cross-sectional design using a retrospective analysis approach. Sampling in this study was carried out using the Non-Probability Sampling Technique, namely the Purposive Sampling Technique. with a population of 2,895 respondents and a sample of 96 respondents, Chi-square testfor data analysis.

## 3. RESULT AND DISCUSSION

Table 1. Respondent Characteristics

| Respondent Characteristics | Number (n) | Percentage (%) |
|---|---|---|
| **Age** | | |
| 17- 25 Years (Late Teenage) | 33 | 34 |
| 26-35 Years (Early Adult) | 52 | 54 |
| 36-45 Years (Late Adult) | 11 | 12 |
| **Total** | **96** | **100** |
| **Education** | | |
| SD | 16 | 17 |
| Junior High School | 18 | 19 |
| Senior High School | 51 | 53 |

| | | |
|---|---|---|
| College | 11 | 11 |
| **Total** | **96** | **100** |
| **Jobs** | | |
| Housewife | 91 | 95 |
| Civil Servant | 3 | 3 |
| Contract | 2 | 2 |
| **Total** | **96** | **100** |
| **Child Gender** | | |
| Man | 50 | 52 |
| Woman | 46 | 48 |
| **Total** | **96** | **100** |
| **Child Age** | | |
| ≥2 Years < 3 Year | 81 | 84 |
| ≥3 Years - < 4 Year | 11 | 12 |
| ≥4 Years < 5Year | 4 | 4 |
| **Total** | **96** | **100** |

Based on table 1, it can be seen that the age of respondents in this study was mostly 26-35 years old (late teens) as many as 52 respondents (54%). The results of the characteristics of the respondents' education, the average highest education level held by respondents was high school education as many as 51 respondents (53%). The results of the characteristics of respondents based on the mother's occupation were divided into 3 categories with the largest number being respondents who work as housewives as many as 91 respondents (95%). The results of the characteristics of respondents based on the gender of the child with the largest number being respondents who have male children as many as 50 respondents (52%). The results of the characteristics of respondents based on the age of the child with the largest number being respondents who are <3 years old as many as 81 respondents (84%).

**Table 2. Univariate Analysis, and Age of Marriage**

| Univariate Analysis | Number (n) | Percentage (%) |
|---|---|---|
| **Infection History** | | |
| There is a history of infectious disease | 50 | 52 |
| No history of disease | 46 | 48 |
| **Total** | **96** | **100** |
| **Family Economic Status** | | |
| Incomplete (does not include 5 mandatory immunizations) | 50 | 52 |
| Complete (includes mandatory immunizations) | 46 | 48 |
| **Total** | **96** | **100** |
| **Stunting Incident** | | |
| Stunting | 49 | 51 |
| No Stunting | 47 | 49 |
| **Total** | **96** | **100** |

Based on table 2, above shows the number of toddlers with a history of infectious diseases, namely 50 respondents (52.1%) and those without a history of infectious diseases, namely 46 respondents (47.9%).Toddlers who had an incomplete immunization history (not including 5 mandatory immunizations) numbered 50 respondents (52.1%), and toddlers who had a complete immunization history (including mandatory immunizations) numbered 46 respondents (47.9%).Of the 96 respondents studied, it was found that the majority of respondents had stunting, namely 49 respondents (51.0%) and respondents without stunting were 47 respondents (49.0%).

**Table 3. Relationship between history of infectious diseases and incidence of stunting**

| History of Infectious Diseases | Stunting incident | | | | n | % | *p* value |
|---|---|---|---|---|---|---|---|
| | Stunting | | No stunting | | | | |
| | n | % | n | % | | | |
| There is a history of infectious disease | 40 | 41.7 | 10 | 10.4 | 50 | 52.1 | 0.000* |
| No History of Infectious Diseases | 9 | 9.3 | 37 | 38.5 | 46 | 47.9 | |
| **Total** | **49** | **51.0** | **47** | **49.0** | **96** | **100** | |

Based on table 3, the results of data analysis using the chi-square test using the SPSS program obtained a p-value (0.000) smaller than α = 0.05 or p-value <α value so it can be concluded that H1 is accepted, meaning that there is a relationship between a history of infectious diseases and the incidence of stunting in the Limboto Health Center work area.

**Table 4. Relationship between history of infectious diseases and incidence of stunting**

| Immunization History | Stunting incident | | | | n | % | *p* value |
|---|---|---|---|---|---|---|---|
| | Stunting | | No stunting | | | | |
| | n | % | n | % | | | |
| Complete (includes mandatory immunization) | 2 | 2.1 | 44 | 45.8 | 46 | 52.1 | 0.000* |
| Incomplete (does not include 5 mandatory immunizations) | 47 | 48.9 | 3 | 3.1 | 50 | 47.9 | |
| **Total** | **49** | **51.0** | **47** | **49.0** | **96** | **100** | |

Based on table 4, the results of data analysis using the chi-square test using the SPSS program obtained a p-value (0.000) smaller than α = 0.05 or p-value <α value so it can be concluded that H1 is accepted, meaning that there is a relationship between immunization history and stunting incidents in the Limboto Health Center work area.

**History of Infectious Diseases in Toddlers in the Limboto Health Center Working Area**

The results of the study conducted on 96 respondents at the Limboto Health Center showed that the majority of toddlers had a history of infectious diseases, namely 50 respondents (52.1%). These infectious diseases are influenced by food and environmental factors such as eating random snacks and a bad environment so that infectious diseases are still high. According to the theory according toCyntithia, (2021)AndMashar, (2021)mentions that infection is one of the health problems that still has a high prevalence with high morbidity and mortality rates. Infection can disrupt the body's metabolism and immune system due to the inflammation process that occurs. In addition to being caused by reduced nutritional intake due to decreased appetite, the relationship between infection history and growth disorders is also closely related to the mechanism of inflammation. Infection is one of the direct factors that causes stunting. Infancy and toddlerhood are periods of very rapid growth, so they require high nutritional intake. However, at this age, nutritional disorders and infectious diseases often occur simultaneously. If these two conditions appear simultaneously, the impact on the child's growth and development will be much more serious(Eldrian, 2022). According to the research results of Nadya Ulfa (2023), there is a

significant relationship between macronutrient intake and a history of infectious diseases in toddlers with malnutrition.

According to the results of the questionnaire, the infectious diseases suffered were dominated by toddlers suffering from ISPA (acute respiratory tract infection) as many as 39 respondents. According to the theoryHidayani, (2020). Acute Respiratory Infection (ARI) is an infection that occurs in the respiratory tract, both upper and lower, which is generally contagious and can cause various conditions, ranging from asymptomatic to severe and life-threatening diseases. The severity of this disease is influenced by the type of pathogen causing it, environmental conditions, and host health factors. Data shows that diarrhea and ARI are the most common diseases experienced by children, with varying frequencies depending on age group. ARI is one of the most common diseases and is the leading cause of death in children under 5 years of age.

The researcher's assumption that the occurrence of infectious diseases in toddlers, namely infectious diseases and acute respiratory infections, cannot be separated from how the care and supervision of the growth and development of the toddler is carried out, diarrhea can occur due to the provision of food that does not comply with cleanliness standards or poor personal hygiene such as washing hands before eating, while the occurrence of acute respiratory infections can occur due to environmental factors that are not clean or air pollution is not maintained, for example if there are adults who smoke around the toddler. It is from the infection that occurs in toddlers that makes growth and development and absorption of nutrients less than optimal so that problems related to child nutrition arise such as stunting.

The results of the study conducted on 96 respondents at the Limboto Health Center showed that toddlers who had no history of disease were 46 respondents (47.9%). This result was caused even though the toddlers did not have a history of infectious diseases, there were other factors that could cause stunting in toddlers.According to Rudy Joegijantoro's theory (2019), community immunity is the immunity of a community to certain infections. The presence of disease, the development of infection, and the duration of immunity are influenced by factors such as diet (especially those rich in protein and vitamins), environmental temperature, a person's physiological condition, and pre-existing or current diseases. According to the results of research conducted by Turnip (2008) which states that children aged 12-24 months are in a critical period of development, especially brain development, so they need good nutrition, but due to various problems, various nutritional problems arise in children (Putri, 2019).

The questionnaire results showed that 23 respondents of toddlers suffered from diarrheal infection. According to the theory (Purnamasari, 2019) Diarrhea is generally caused by bacterial infections, with the types of bacteria varying depending on age, location, time, and season. Diarrhea is a common symptom of gastrointestinal infections caused by a variety of pathogens, such as bacteria, viruses, and parasites. The main pathogens that cause diarrhea include Escherichia coli, Vibrio cholerae, rubella, Campylobacter, and Salmonella. Research shows that there is a relationship between infectious diseases and stunting, where infections can affect nutritional intake in toddlers, and decreased nutritional intake can contribute to stunting.

**Immunization History in Toddlers in the Limboto Health Center Work Area**

The immunization history examined in this study included 5 mandatory immunizations, namely Hepatitis B, BCG, DPT, Polio, and Measles immunizations. The results of the study conducted on 96 respondents at the Limboto Health Center showed that toddlers with incomplete immunizations (not including 5 mandatory immunizations) were 50 respondents (52.1%). This shows a lack of parental attention to their children in carrying out regular and complete immunizations. In accordance with the theory According to Ranuh, (2011Immunization is the process of providing immunity to the body against disease by inserting a vaccine that will produce anti-bacterial substances to fight dangerous diseases. The main purpose of immunization is to prevent infectious diseases that can attack infants and toddlers. Immunization carried out early is very important to prevent these diseases. The Indonesian government strongly supports the

implementation of the vaccination program as an effort to reduce morbidity and mortality in infants, toddlers, and preschool children. Babies who do not yet have immunity will be more susceptible to infection, which can result in loss of body energy. One of the impacts of this infection is a decrease in appetite in children(Tomahayu, 2024).

The purpose of immunization is also to stimulate the body's immune system to produce specific antibodies to protect the body from disease attacks (Nurhikmah, 2021). According to the theory by the Ministry of Health, (2024) immunization is important to protect children from the threat of various diseases that endanger health. However, what parents often worry about is the reactions or side effects that arise after immunization, such as pain, swelling at the injection site and fever. Reactions from vaccines or immunizations occur when the body's immune system reacts to one or more vaccine ingredients. However, the symptoms that arise can be overcome without causing long-term impacts. The results of this study are not in line with the results of the study by Agustia, Rahman, & Hermiyanty (2018) Incomplete immunization can be a risk factor for stunting in toddlers aged 12-59 months in the Poboya Mining area, Palu City (Khairani, 2020).

According to the questionnaire results, 46 respondents (47.9%) had a history of complete immunization (covering 5 mandatory immunizations). Parents who are aware of the importance of complete basic immunization are still lacking. According to Vasera's theory, (2023) providing complete basic immunization to children in the first stage has a major impact on their growth and development. By providing basic immunization, it is hoped that children will be protected from diseases that often cause stunted growth, disability and death. Basic vaccination is required between the ages of 0 and 9 months, including hepatitis B, BCG, polio/IPV, DPTHB-HiB, and measles vaccines.

This is also supported by research from Wanda, (2021). There is a relationship between the history of basic immunization status and the incidence of stunting in toddlers in Hegarmanah Village, Jatinangor District with a value of $p < 0.05$ ($p = 0.00 < 0.05$) and there is a risk of stunting in toddlers with incomplete immunization 4.9 times compared to toddlers with complete immunization.

The researcher's assumption is that immunization is very influential in maintaining the health status of toddlers, parents who are worried about the occurrence of post-immunization events only need to be given guidance and accurate information about immunization, the impacts and symptoms that will arise after immunization. Maintained health status can maintain the stability of nutrient absorption, maintain motor and sensory growth and development according to age and the growth and development process. Diseases that can be prevented by immunization are also very diverse, which if not prevented can cause pain in toddlers in the long term.

**Stunting Incidents in Mothers with Toddlers in the Limboto Health Center Work Area**

The results of the study conducted on 96 respondents at the Limboto Health Center showed that mothers had toddlers with stunting, namely 49 respondents (51%). These results indicate a high incidence of stunting in the Limboto Health Center work area with an assessment that has been carried out stunting < -3SD to < -2 SD so that early handling is needed to prevent stunting. This is in line with research byLuh et al., (2021)with the results of the study, namely, of the 212 toddlers, 116 toddlers (54.7%) experienced stunting. The measuring tool used was the Z-score table of nutritional status. This is in line withRegulation of the Minister of Health of the Republic of Indonesia, (2020)which states that children in this category may have growth problems, which need to be confirmed by measuring BB/TB or BMI/U. Children in this category tend to have very tall heights, which are generally not a problem unless there is a possibility of endocrine disorders, such as tumors that produce growth hormones. If there is a suspicion of endocrine disorders (for example, a child who is much taller than his age, while the parents are normal height), it is better to refer to a pediatrician. Although the interpretation of BMI/U can indicate malnutrition or undernutrition, the diagnosis of malnutrition and undernutrition according to the guidelines for the Management of Malnourished Children prioritizes the use of the Body Weight Index according to Body Length or Height (BB/PB or BB/TB). According to the theory put forward by Candra (2020), stunting is the impact of chronic malnutrition that lasts for a long time. Therefore,

individuals who experience stunting from an early age are at risk of experiencing problems due to prolonged malnutrition, such as mental, psychomotor, and intelligence disorders. Although malnutrition control programs have been implemented for several years, these efforts have not specifically addressed chronic malnutrition that contributes to stunting. As a result, the prevalence of stunting remains high, although the prevalence of other malnutrition, such as wasting, has decreased significantly.(Chandra, 2020).

According to the research results of Hikmah et al. (2022), stunting is a global nutritional problem, especially in poor and developing countries. Stunting occurs due to growth failure caused by nutritional deficiencies that last for a long time, starting from pregnancy to 24 months of age. There are various factors that contribute to the high incidence of stunting in toddlers. In addition, many people are not yet fully aware that stunting is a serious problem compared to other nutritional problems.(Hikmah et al., 2022).

According to the results of the characteristics of the respondents, it was found that respondents with male gender in toddlers were 50 respondents (52%). The high number of toddlers with male gender is because men need more energy and protein than women. This is in accordance with the theory put forward by Ramli et al. (2009) The gender and age of toddlers are factors that influence child growth that cannot be changed. Male toddlers are more likely to experience stunting than female toddlers. In addition, toddlers over 24 months old are at greater risk of experiencing stunting than younger toddlers, although growth disorders can occur at the age of 0-24 months or even earlier. According to Sudiman in Siswati (2008) the incidence of stunting increases at the age of 2-3 years, because growth peaks at that age and often good nutritional intake is not met(Student, 2018).

This is in line with the results of Rahayu's research (2020) stunting in toddlers can inhibit the child's development, which has a negative impact on their future life. Boys are more susceptible to malnutrition than girls. However, the influence of gender on the incidence of stunting is still a matter of debate.(Rahayu & Casnuri, 2020). Researchers assume that providing knowledge to mothers about the importance of nutrition and how to provide proper food. Parents need to be equipped with knowledge about how to prevent stunting and the importance of balanced nutrition.

According to the results of the characteristics of the respondents, it was found that respondents with age (≥2 Years - <3 Years) were 81 respondents (84%). These results indicate that the age above 2 years is the period of growth in toddler height. So that it can catch up with the growth and development of the toddler's brain. According to WHO (2005) that babies born with stunting still have 730 days of the golden period to catch up on growth, both in terms of height and brain development. Appropriate nutritional interventions for babies born with stunting include providing exclusive breastfeeding until the age of 6 months, providing MP-ASI according to balanced nutrition guidelines after 6 months, and continuing breastfeeding until the age of 2 years (Student, 2018). Researchers assume that at the age of 25-60 months, children's activity is high while their intake of nutritious food is lacking. So it needs to be balanced by getting more nutritious food intake.

The results of a study conducted on 96 respondents at the Limboto Health Center showed that mothers who had toddlers without stunting were 47 respondents (49%). These results prove that toddlers without stunting receive nutritious food since they were in the womb or receive food intake from their parents. According to the theory put forward by Simbolon (2013), toddlers who experience stunting have a 3.4 times greater risk of obesity. They use up energy and experience lower fat oxidation compared to children who are not stunted. If their food intake contains a lot of carbohydrates and fat, children who are stunted tend to store fat more easily than children who are not stunted.(Student, 2018). According to the research results of Hoffman, Vitolo and Campagnolo (2012) in Brazil in children aged 3-4 years, the study showed that children who experienced stunting, both mild and severe stunting, at the age of 12-16 months, had higher levels of total cholesterol and HDL compared to children who did not experience stunting.(Student, 2018).

According to the results of the characteristics of the respondents, there were 11 respondents (11%) with college education. These results show that college education is capital in

reducing the incidence of stunting. This is in accordance with the theory put forward by Siswati, (2018) that mothers who only have education up to high school tend to have a higher risk of having children who experience stunting compared to mothers who have higher education. This is a concern and challenge for the government to set a minimum limit for the level of basic education that must be achieved to reduce or overcome the problem of stunting in toddlers, as well as to provide adequate educational facilities and infrastructure, especially in remote areas.(Student, 2018). This is in line with the research results of Permanasari et al. (2021) Higher maternal education can reduce the risk of stunting by two times compared to mothers with low education. The selection of villages as the focus location for handling stunting also affects the prevalence of stunting. In addition, there are several determinant factors that play a role in the occurrence of stunting, such as the sex of the child, the duration of breastfeeding for more than 24 months, the age of the child, early initiation of breastfeeding (IMD), growth monitoring, maternal age, and the level of maternal education (Permanasari et al., 2021).

**The relationship between a history of infectious diseases and the incidence of stunting in toddlers inLimboto Health Center Working Area**

The results of data analysis using the chi-square test using the SPSS program obtained a p-value (0.000) smaller than α = 0.05 or p-value <α value so that it can be concluded that H1 is accepted, meaning that there is a relationship between a history of infectious diseases and the incidence of stunting in the Limboto Health Center work area.

Based on the research results, 40 respondents (41.7%) had a history of infection and were also included in the category of stunted toddlers. These results show that toddlers with infectious diseases will be at high risk of stunting. According to the theoryMashar, (2021)that Infection can cause disorders in the body's metabolism and immune system due to inflammation. In addition, lack of nutritional intake due to decreased appetite also plays a role. The relationship between a history of infectious diseases and growth disorders is related to the mechanism of inflammation that occurs. When inflammation occurs, the hsRC (High-sensitivity C-reactive Protein) protein is released by the body, which then affects resistance to growth hormone (GH). This inflammatory mechanism also inhibits the work of IGF-1 (Insulin-like Growth Factor-1), which functions as a mediator between GH and the growth of muscle and bone cells in humans. According to the results of Agung's research (2020), there is a significant relationship between a history of infectious diseases and the incidence of stunting in toddlers.

According to the results of the characteristics of respondents, the level of elementary school education is quite high, namely 16 respondents (16.7%). According to Notoamodjo's theory, (2010) that knowledge is one of the factors that can help individuals or communities in determining the actions to be taken. Researchers assume that getting good education and case management can help reduce the incidence of stunting.

The results of the study showed that toddlers had no history of infection but were stunted as many as 9 respondents (9.3%). These results show that there are other factors that cause stunting. According to the theory of reciprocal interaction, malnutrition can increase the risk of infection, and conversely, infection can worsen malnutrition, so that both reinforce each other. Children can experience stunting because their growth is stunted since in the womb, which is known as fetal growth retardation. Stunting itself is a form of chronic growth disorder characterized by height that is not in accordance with age. According to the results of Ermawati Sundari's research (2019), a history of infection is related to the occurrence of stunting. This is due to the ability of infection to inhibit linear growth through various mechanisms, such as decreased food intake, disrupted nutrient absorption, loss of nutrients from the body, increased metabolic needs, and inhibited distribution of nutrients to body tissues.

The results of the characteristics of respondents with elementary school education level are quite high, namely 16 respondents (16.7%). According to the results of research byEldrian et al., (2023)with the title of the relationship between infectious disease history and stunting in toddlers at the Cipadung Health Center in Bandung City. The results of the study showed that the variable that had a significant relationship was a history of diarrhea. The conclusion of this study

states that infectious diseases related to stunting include a history of diarrhea and a history of Acute Respiratory Tract Infection (ARI).

Researchers assume that the better the nutritional status of toddlers, the greater the possibility of avoiding infectious diseases. Optimal nutrition can strengthen the body's resistance to infections, such as diarrhea, worms, and ARI. In addition, a home environment exposed to cigarette smoke can increase the risk of toddlers getting ARI. Low immunization coverage not only makes toddlers more susceptible to infection, but can also extend the duration of infectious diseases experienced.

The results of the study showed that toddlers had a history of infection but were not stunted as many as 10 respondents (10.4%). This shows that the factor of disease occurrence is caused by pathogens transmitted by people. This is in accordance with the theoryCyntithia, (2021)Infection is one of the health problems with a high prevalence, accompanied by significant morbidity and mortality rates. The history of infectious diseases refers to conditions caused by pathogens or their toxins, which can be transmitted from humans, animals, or contaminated objects to susceptible individuals, either through direct or indirect contact.

According to the results of Khairani's research (2020), information regarding the history of infectious diseases in the last three months was obtained through direct interviews with mothers of toddlers, not based on medical records from the Health Center or the results of a doctor's diagnosis. Based on the results of the interview, it was found that the diseases most often suffered by toddlers were diarrhea and acute respiratory infections (ARI).

The results of the study showed that toddlers were not stunted with no history of infection as many as 37 respondents (38.5%). This shows that the body's immunity can reduce the incidence of stunting. This is in accordance with the theory of Rudy Joegijantoro (2019) Community immunity refers to the ability of a community group to protect themselves from certain infections. The level of susceptibility to disease, the course of infection, and the duration of immunity formed are influenced by various factors, such as a diet rich in protein and vitamins, environmental conditions such as temperature, the physiological state of the individual, and the presence of diseases that are currently or have been previously suffered.

The results of the characteristics of respondents with college education were 11 respondents (11.5%). Higher education can resolve stunting. Researchers assume that a history of infectious diseases is one of the main factors contributing to stunting in toddlers. Toddlers who experience infections tend to experience decreased appetite, and in some cases can lose food intake due to vomiting or diarrhea. This condition has an impact on disrupting the process of nutrient metabolism in the body.

The researcher's assumption is that stunting can occur due to infections in toddlers. As long as the child experiences an infection, the body's energy needs also increase to fight pathogens. Energy needs that are not balanced with sufficient nutritional intake can interfere with the growth of toddlers, especially if the infection occurs for a long time.

**The relationship between immunization history and the incidence of stunting in toddlers inLimboto Health Center Working Area**

The results of data analysis using the chi-square test using the SPSS program obtained a p-value (0.000) smaller than α = 0.05 or p-value <α value so that it can be concluded that H1 is accepted, meaning that there is a relationship between immunization history and stunting incidents in the Limboto Health Center work area.

The results of the study showed that stunting patient data with incomplete immunization history status (not including 5 mandatory immunizations) amounted to 47 respondents (48.9%). This shows that the main key to increasing immunity is immunization. According to the theoryMashar, (2021)Immunization in children is very important to improve their immune system. If not done, children will be more susceptible to infections that can reduce appetite and interfere with nutrient absorption, so that the nutritional intake received becomes very limited. Intake of micro and macro nutrients in the first two years of life is crucial to support child growth. The child's immunization status is an indicator that the child has received health services, and providing complete immunization can help overcome new nutritional problems, with the hope of

having a positive impact on the child's nutritional status in the long term. Even though they have been immunized, this does not guarantee that children will avoid stunting, because there are other factors such as parenting patterns, sanitation, drinking water sources, history of infections such as diarrhea and ARI, and exposure to cigarette smoke that also influence the occurrence of stunting. According to the results of this study, it is in line with research conducted by Agus et al. (2016) on 96 toddlers in the Banda Raya, Meuraxa, and Batoh Health Center areas, Banda Aceh. there is a significant relationship between the completeness of basic immunization and the incidence of stunting.

The results of the characteristics of respondents with elementary school education levels are quite high, namely 16 respondents (16.7%). Low education triggers minimal knowledge in caring for children. So that in fulfilling the completeness of immunization in children is disrupted.

The results of the study showed that stunting patient data with complete immunization history status (covering 5 mandatory immunizations) was 2 respondents (2.1%). These results show that the factor of stunting is not only due to incomplete immunization but there are other factors. According to the theoryVasera et al., (2023)Nutritional status in children under 5 years of age greatly affects the quality of human resources in the future. Nutritional conditions play an important role in the development of children's intelligence. Stunting is one of the problems that hinders human development globally. In addition, antibodies formed after immunization will continue to circulate in the body and build the immune system. When the body is exposed to the same microorganisms as those in the vaccine, these antibodies will protect the body and prevent infection. This is supported by research in line withFadhila et al., (2024)with the title of the relationship between the provision of complete basic immunization and the incidence of stunting in toddlers in the working area of the Singandaru Health Center. The results of the study showed that of the 17 toddlers with complete basic immunization status who experienced stunting, 21.0% experienced stunting, while 79.0% did not experience stunting. Meanwhile, of the 35 toddlers with incomplete basic immunization status who experienced stunting, 57.4% experienced stunting, and 42.6% did not experience stunting. In conclusion, there is a significant relationship between the provision of complete basic immunization and the incidence of stunting in toddlers in the working area of the Singandaru Health Center. The researcher stated that immunization is important to maintain the immunity of toddlers until adulthood, and complete basic immunization is a vaccine that must be given to toddlers.

The results of the study showed that patient data were not stunted and had an incomplete immunization history (not including 5 mandatory immunizations) as many as 3 respondents (3.1%). According to the theoryAprilia & Tono, (2023)Incomplete immunization does not completely affect development, because child development takes place through various stages. Malnutrition during pregnancy, growth, and early childhood can contribute to stunting. Malnutrition that is not met from the womb until after birth can cause health problems in toddlers.

Although immunization in toddlers is complete, it does not guarantee that toddlers are free from stunting, because there are various other factors that can cause stunting. Some factors that contribute to stunting include parental knowledge, exclusive breastfeeding, poor sanitation conditions such as the absence of toilets, stagnant water channels, open trash bins, and an unclean environment. Other factors include parental education, parental occupation and income, gender of toddlers, Low Birth Weight (LBW), length of birth of toddlers, and the mother's habit of rarely washing hands.

The assumption of researchers is that immunization given to toddlers can protect them from infectious diseases, children who receive complete immunization have a strong immune system, thus preventing recurrent infections. By protecting children from disease during the first 1000 days of life, immunization allows optimal growth during the crucial period of physical and cognitive development, thus preventing stunting.

The results of the study showed that patient data were not stunted and had a complete immunization history (not including 5 mandatory immunizations) as many as 44 respondents (45.8%). This shows the effectiveness of complete immunization. Complete immunization means protecting children from the risk of stunting. Because it is protected from disease. This is in

accordance with the theory of the purpose of immunization, namely reducing the number of illnesses, deaths and disabilities due to diseases that can be prevented by immunization (PD3I).

The results of the characteristics of the level of education of college respondents are 11 respondents 11.5%. This makes the high level of complete immunization without stunting. Because with higher education capital, it can provide more knowledge in preventing diseases and keeping children healthy. Researchers assume that complete immunization can prevent stunting.

## 4. CONCLUSION

The chi-square test using the SPSS program obtained a p-value (0.000) smaller than α = 0.05 or p-value <α value so that it can be concluded that H1 is accepted, meaning that there is a relationship between a history of infectious diseases and the incidence of stunting in the Limboto Health Center work area. In conclusion, there is a relationship between a history of infectious diseases and a history of basic immunization status with the incidence of stunting at the Limboto Health Center, Gorontalo Regency.

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