Journal of Health and Behavioral Science
Vol. 4, No. 4, December 2022, pp. 482~507

Risk Factors for Stunting in Toddlers

Henrico Tampatianus Bago[1], Imelda F. E Manurung[2], Indriati A. Tedju Hinga[3]
[1-3]Public Health Study Program, Faculty of Public Health, University of Nusa Cendana
e-mail: [1]Rikobago99@gmail.com, [2]Imelda.manurung@staf.undana.ac.id, [3]Indriati.tedjuhinga@staf.undana.ac.id

Abstract. This study aims to analyze several risk factors for stunting in children under five that are rarely studied in Indonesia and the Province of East Nusa Tenggara, namely factors of water, hygiene, environmental sanitation, history of the quantity of maternal ANC visits during pregnancy, and family food security. This research was conducted in the working area of the Noemuti Health Center. This research is an analytic observational study with a case-control study approach and consists of a case sample of 36 toddlers and a control sample of 36 toddlers. Data analysis in this research is a bivariate analysis using the chi-square test. The results of the analysis show that eight variables are risk factors for stunting in toddlers in the work area of the Noemuti Health Center in 2021, namely birth distance, family food security, adequacy of clean water, clean water sources, physical quality of clean water, mother's hand washing habits with soap and running water, history of quantity of maternal antenatal care visits during pregnancy, and frequency of illness. Health promotion efforts and cross-sectoral cooperation are needed to tackle the stunting problem.
Keywords: *Stunting; water; hygiene; sanitation; history of maternal ANC visits quantity*

Abstrak. Penelitian ini bertujuan untuk menganalisis beberapa faktor risiko kejadian stunting pada balita yang jarang diteliti di Indonesia dan Provinsi Nusa Tenggara Timur yaitu faktor air, higine, sanitasi lingkungan, riwayat kuantitas kunjungan ANC Ibu selama kehamilan, dan ketahanan pangan keluarga. Penelitian ini dilaksanakan di wilayah kerja Puskesmas Noemuti. Penelitian ini merupakan penelitian observasional analitik dengan pendekatan case control study. Sampel dalam penelitian ini terdiri dari sampel kasus sebanyak 36 balita dan sampel kontrol sebanyak 36 balita. Analisis data dalam penelitian ini yaitu analisis bivariat mengunakan uji chi square. Hasil analisis menunjukan bahwa terdapat delapan variabel yang merupakan faktor risiko kejadian stunting pada balita di wilayah kerja Puskesmas Noemuti tahun 2021, yaitu jarak kelahiran, ketahanan pangan keluarga, kecukupan air bersih, sumber air bersih, kualitas fisik air bersih, kebiasaan cuci tangan ibu menggunakan sabun dan air mengalir, riwayat kuantitas kunjungan antenatal care ibu selama kehamilan, dan frekuensi sakit. Diperlukan upaya promosi kesehatan dan kerja sama lintas sektor untuk menanggulangi masalah stunting.
Kata kunci: *Stunting; air; higine; sanitasi; riwayat kuantitas kunjungan ANC ibu*

Journal of Health and Behavioral Science
Vol. 4, No. 4, December 2022, pp. 482~507

Article history:
Received 27 February 2022
Received in revised 10 October 2022
Accepted 2 December 2022
Available online 20 December 2022

Introduction

Stunting is a growth failure in toddlers that occurs because toddlers experience illness and lack of nutritional intake in the first 1000 days of life so that the height or length of the toddler's body is less than -2 standard deviations set by WHO after anthropometric measurements compared to the population mean height (Helmyati et al., 2019).

The stunting problem in Indonesia is a public health problem that needs serious attention and must be intervened immediately. This is because the prevalence of stunting in Indonesia in the last three years has consistently been above 20%, or the standard set by WHO, as the standard for stunting prevalence as a public health problem. In 2017, Indonesia's overall prevalence of under-fives suffering from stunting was 29.6% (Kementrian Kesehatan RI, 2018b). The results of the 2018 Riskesdas report, the prevalence of stunting under five in 2018 increased by 1.2% from 2017 to 30.8% (Kementerian Kesehatan RI, 2018). In 2019, the prevalence of under-five edited decreased to 27.67%, and the prevalence of stunting in East Nusa Tenggara province was 43.8% (Kementrian Kesehatan RI, 2019).

North Central Timor Regency is one of the regencies in East Nusa Tenggara Province, with the highest prevalence of stunting cases in Indonesia. Based on the data obtained, in 2018, the number of toddlers suffering from stunting in North Central Timor Regency was 7154 stunting toddlers with a percentage of 51.26%, one of the health centres with the highest number of stunting toddlers was the Noemuti Health Center, with 414 stunting (North Central Timor District Health Office, 2018). In 2019, the number of children under five who were stunted was 7466 stunting sufferers, or an increase of 490 stunting toddlers from 2018, while the number of stunting toddlers at the Noemuti Health Center was 273 stunting children (Data Stunting Kabupaten Timor Tengah Utara Tahun 2019). In 2020, the number of

stunting toddlers from January to August was 7836 stunting toddlers, and the number of stunting toddlers at the Noemuti Health Center was 130.

Stunting is a nutritional problem with multifactorial causes. Stunting is not only caused by inadequate nutritional intake and infectious disease factors suffered by toddlers in the first 1,000 days of life. Particular nutrition interventions carried out in Indonesia, especially in the health sector to tackle stunting sufferers, contributed 30%. While the remaining 70% is the contribution of nutrition interventions involving various sectors such as family food security in terms of quality and quantity, the availability of clean water and adequate sanitation and accordance with health standards, overcoming economic and social problems, educational inequality, and so on (Kementrian PPN/Bappenas, 2018). The risk factors for stunting are also different for each region (Laili, 2018).

Research on the factors that cause toddlers to suffer from stunting with complex causes has been carried out in various developing countries. The research focuses not only on two direct factors causing stunting in toddlers, namely nutritional adequacy and infectious diseases experienced by toddlers but other indirect factors, such as parental nutritional adequacy, family socioeconomic status, education level, etc. In addition to these factors, there are several determinants of stunting that are rarely studied in Indonesia when compared to other developing countries, namely factors of clean water sources, provision, access, adequacy, and quality of clean water following health requirements, as well as hygiene and sanitation (Olo et al., 2021). In addition to water, hygiene, and sanitation factors, several factors that are rarely studied in East Nusa Tenggara Province are the problem of food security and the quantity of ANC visits which are some of the determinants of stunting in children under five in Indonesia.

In addition to the problem of stunting, other problems that need attention and must be addressed immediately are the problem of family food security, environmental health problems related to environmental sanitation and clean water supply, and family health which is a determinant of stunting. The problem of

household food security is a problem that needs serious attention and must be intervened immediately. This is because it concerns the nutritional adequacy of the community, especially toddlers, and this problem often occurs in the TTU district. Based on information obtained from the Timor Express newspaper dated October 11, 2020, the people of TTU in 24 sub-districts are experiencing food insecurity because of the drought that hit all areas in TTU Regency, and many people experiencing crop failure (Usboko, 2020).

Environmental sanitation hygiene issues are still a concern and need to be immediately intervened, namely the problem of ownership of healthy latrines that are by health requirements (Nubabi, 2020). The next problem of hygiene and environmental sanitation is related to access, adequacy, and quality of clean water. This issue needs attention because, based on information obtained from the NTT News.com newspaper dated September 19, 2020, people in the Noemuti District, TTU District, still have difficulty obtaining clean water. In the dry season, to meet the need for clean water for consumption, to eat, drinking, washing, and bathing, the community still uses river water (surface water) (Ciompah, 2020). In contrast, surface water is one source of clean water that is not suitable for consumption because it does not meet health requirements for clean water for consumption, in terms of physical, chemical, and biological as well as radioactive. This is because river water comes from rainwater and is the most polluted water by human activities, plants, animals, and other substances (Sumantri, 2017). So surface water, if consumed, will cause health problems such as diarrhea, cholera, dysentery, typhoid, and others.

There are still many family health problems in the working area of the Noemuti Health Center that need attention, namely the quantity of Antenatal Care (K1-K4) visits. In 2019, the number of ANC visits at the Noemuti Health Center was still below 75%. K1 visits in the Noemuti Health Centre working area in 2019 were 72%, while K4 visits decreased to 69%. The following family health problem is that there are still many people in the working area of the Noemuti Health Center who have

yet to participate in the postnatal family planning program. According to the data, the TTU community participating in family planning has yet to reach 15% in 2019 (Dinas Kesehatan Kabupaten Timor Tengah Utara, 2019). Based on the description above, the authors are interested in researching risk factors for stunting in toddlers in the Work Area of the Noemuti Health Center, North Central Timor Regency, in 2021.

Method

This type of research is analytically observational, and the research design used is a case-control study. This research was conducted in November-December 2021 in the working area of the Noemuti Health Center. The population in this study were all toddlers in the working area of the Noemuti Health Center, which consisted of toddlers who were stunted (cases) and toddlers who were not stunted (controls). The sampling technique in this study is probability sampling. Based on the calculation results, the number of samples to be taken is 72, consisting of 36 toddlers as cases and 36 as controls. Data was collected by using a questionnaire method. The research instruments used were questionnaires and observation sheets. Questionnaires were used to collect data on maternal education level, family size, birth spacing, household food security, mother's habit of washing hands with soap, and history of maternal antenatal care visits during pregnancy. In contrast, observation sheets were used to collect data on the cleanliness of water sources, sufficient clean water, physical quality of water, and ownership of healthy latrines.

The data analysis used in this research is univariate, bivariate data analysis. Hypothesis testing uses the chi-square test with the limit of the significance of each variable (α) at 0.05 and a confidence level of 95%. To justify the risk factors for stunting, it is continued by calculating the Odds Ratio (OR).

Result

The results showed that of the 72 mothers of children under five who were respondents in this study, most had an age range of 36-45 years. As many as 34

people (47,2%) among mothers of children under five became respondents in this study. Most of them had the latest level of education, namely SMP, as many as 23 people (31.9%).

Table 1
The results of the distribution of respondents' characteristics of risk factors for stunting in toddlers in the Noemuti Health Centre work area in 2021.

Characteristics	Frequency (n=72)	Percentage %
Age		
17-25	20	27,8
26-35	18	25%
36-45	34	47,2
Education Level		
SD	20	27,8
SMP	23	31,9
SMA	19	26,3
D3 dan S1	10	13,9

Table 2
The results of the bivariate analysis of the risk factors for stunting in children under five in the work area of the Noemuti Health Center in 2021

	Stunting Incident				**Total**			
	Stunting		**Normal**					
Variable	**n**	**%**	**n**	**%**	**n**	**%**	***P value***	**OR (95%Cl)**
Level of education								
Low	18	25	2	2,7	20	27,7	0,733	-
Middle	14	19,4	28	38,8	42	58,3		
Big Family								
≤ 4	12	27,7	20	61,1	32	44,4	0,096	-
> 4	24	72,3	16	38,9	41	55,6		
Birth Distance								
≤ 2	13	36,1	24	66,7	37	51,3	0,018	3,53
>2	23	63,8	12	33,3	35	48,7		(1,340-9,343)
Food Insecurity								
Food insecurity	31	86,1	19	52,7	50	69,5		5,547
Food Resistant	5	13.9	17	47,2	22	30,5	0,04	(1.75-17,)
Healthy latrine								

Not eligible	16	44,4	11	30,5	27	37,5	0,33	-
Qualify	20	55,6	25	69,4	45	62,5		
Clean Water Source								
Not eligible	22	55,6	6	33,5	28	38,9	0,000	7,857
Qualify	14	44,4	30	69,5	44	61,1		(2,607-23,6)
Clean Water Adequacy								
Not enough	28	77,8	17	47,2	45	62,5	0,014	3.912
Enough	8	22,2	19	52,7	27	37,5		(1.40-10.87)
Physical Quality of Clean Water								
Not eligible	18	50	7	19,5	25	34,7	0,013	4,413
Qualify	18	50	29	80,5	47	65,3		(1,4-11,8)
Mother's Hand-Washing Habits								
Bad	26	72,2	12	33,3	38	52,8	0,02	5,2
Good	10	27,8	24	66,7	34	47,2		(1,9-14,2)
Mother's ANC Visit History								
<4	24	61,1	8	27,8	32	44,5	0,02	7,00
4	12	38,9	28	72,2	40	55,5		(2.45-19.95)
Disease Frequency								
>5	12	33,3	22	61,1	34	47,2	0,03	3,14
≤5	24	66,7	14	38,9	38	52,7		(1,19-8,241)

The bivariate analysis showed a relationship between birth spacing and the incidence of stunting in children under five (p-value 0.018; OR=3.53). The incidence of stunting is more common in toddlers who come from families with a birth spacing of <2 years compared to toddlers who come from families with a birth spacing of >2 years. There is a relationship between family food security and the incidence of stunting in children under five (p-value 0.04; OR = 5.547). The incidence of stunting is more common in children under five who come from food-insecure families (86.1%) compared to toddlers who come from food-insecure families (13.9%). There is a relationship between clean water sources that meet health standards and the incidence of stunting (p-value = 0.00; OR = 7.857). The incidence of stunting is more common in toddlers who come from families whose clean water sources do not meet health standards (55.6%) compared to toddlers who come from families whose clean water sources meet health requirements (44.4%). Adequacy of

clean water is related to the incidence of stunting in children under five (p-value = 0.014; OR = 3.912). Toddlers who come from families with clean water that is less than 60 litres/per person/day are more at risk of experiencing stunting. The physical quality of clean water is a risk factor for stunting in children under five (p-value = 0.013; OR = 4.423). Toddlers from families with physical water quality that do not meet health requirements are more at risk of experiencing stunting. The habit of washing the mother's hands using soap and water has a significant relationship with the incidence of stunting in toddlers (p-value = 0.01; OR = 5.2). Stunting was more common in infants whose mothers did not wash their hands with soap and running water (72.2%) than in mothers who washed their hands with soap and running water (27.8%). There is a relationship between the history of antenatal care visits of pregnant women with the incidence of stunting (p-value = 0.02; OR = 7.00). Stunting is more common in toddlers for nine months in the womb. Mothers of toddlers do not make antenatal care visits according to health requirements, namely four visits. In the case group, the number of mothers under five who, during pregnancy, did not make ANC visits according to health requirements was 61.1% compared to mothers under five who did ANC visits according to health requirements, which was 38.9%. The frequency of illness in children under five is related to the incidence of stunting in children under five (p-value = 0.003; OR = 3.14). Toddlers who were sick during the last six months were >5 times more likely to suffer from stunting.

Discussion

1. The Relationship Between the level of Education and the Incidence of Stunting

Low maternal education is a risk factor for stunting in toddlers. This is because the higher a person's education, the higher the level of knowledge. Mothers with higher education levels have broader knowledge about good and correct parenting for children, exclusive breastfeeding for six months, choosing healthy and nutritious foods, providing nutritious food to toddlers, and

maintaining and caring for the environment so that the environment does not become a source of problems health for families, especially toddlers. Mothers with low education generally have a low level of knowledge as well. Mothers with low levels of education will have a good level of knowledge if they receive a lot of health education or adequate nutrition counseling (Helmyati et al., 2019).

The results showed no relationship between maternal education level and the incidence of stunting in toddlers in the Noemuti Public Health Center working area in 2021. The study's results contradicted the research conducted by Trasaralatifah et al. (2020). The results showed that the level of a mother's education affected the nutritional status of a toddler.

This study's results align with the results of a study conducted in Peru. The study results show that nutrition education during pregnancy, which emphasizes giving additional food during pregnancy, is very effective in changing behavior and affecting the linear growth of children. In another study conducted in China and India, the results showed that nutrition education with the central message of consumption of nutrient-rich foods influenced linear growth in children (Helmyati et al., 2019).

2. Family Relationship with Stunting Incidents

Family size is the total number of people in the household and is counted in one family and has one household budget. Large family sizes are divided into two categories: small and large families. A family or household is said to be small if the number of family members in the household is 4, whereas if the number of family members is > 4 people, then the family is said to be a large family (Laili, 2018).

A large number of family members increases the risk of toddlers suffering from being underweight and stunting compared to toddlers who come from families with tiny family members (Haris et al., 2019). This happens because the number of family members affects the availability of food in the household, the

food distribution to each household member, the amount of intake eaten, and the quality or quality of the food available (Helmyati et al., 2019).

Statistical tests prove that there is no relationship between family size and the incidence of stunting in the working area of the Noemuti Puskesmas in 2021. The results of this study are contrary to research conducted on toddlers who are fond of children. The results show that one of the causes of toddlers in the tribe of children suffering from stunting is that toddlers come from families with many family members. The incidence of stunting in Balita is more at risk for families with low incomes and low-income families with significant family members; this is because each additional family member will affect the distribution of food, the amount and quality of food consumed, and the diversity of types of food (Haris et al., 2019).

3. Relationship between Birth Distance Status and Stunting Incidence

Birth spacing is the range of years of birth between children. Based on the standards of the BKKBN, the minimum distance between children is two years. Mothers who give birth to children with a birth spacing of fewer than 24 months or two years have a risk of giving birth to premature infants and toddlers with low birth weight (LBW) or less than 2.5-kilo grams. Toddlers born with low birth weight are a determinant of stunting in toddlers (Kementerian Kesehatan RI, 2016). In addition, mothers who give birth to toddlers with birth spacing that are too close or less than two years are more at risk of experiencing death which can attack both mothers and toddlers (Cicih, 2019).

Birth spacing that is too close or less than 24 months affects the nutritional intake of toddlers due to maternal age at pregnancy, food distribution, breastfeeding distribution, culture, and access to health facilities. Birth spacing that is too close will affect parenting and care for toddlers. Parents will have trouble caring for toddlers, which is the cause of toddlers suffering from stunting (Pongrekun et al., 2020).

The results showed a relationship between birth spacing <2 years and the incidence of stunting in toddlers. The results of this study are in line with the results of research conducted on children under five in the Konawe Selatan district in 2020, where the results showed that toddlers born with a birth spacing of fewer than two years had a 3.5 times greater risk of suffering from stunting (Pongrekun et al., 2020).

4. The Relationship Between Family Food Security and the Incidence Of Stunting

Food security is access by all at all times to sufficient and quality food for an active and healthy life. Food security includes, at a minimum: the availability of adequate and safe ready-to-use nutritious food and the ability to obtain socially acceptable food (e.g., without resorting to emergency food supplies, scavenging, stealing, or other coping strategies) (Bickel et al., 2000).

Food insecurity in the family can increase the risk of growth and development failure in toddlers. Food insecurity includes concerns about the adequacy of household food supply and adjustment of food types and food management, including a decrease in food quantity and quality (Bickel et al., 2000). Families who experience food insecurity will affect fulfilling the nutritional adequacy of family members, especially the nutritional adequacy of toddlers. Toddlers from food-insecure families are more at risk of stunting if food insecurity occurs for a long time. Toddlers will experience growth delays because they lack access to nutritious food (Helmyati et al., 2019).

The results showed a relationship between household food security and the incidence of stunting. The results of this study follow the results of several other studies. Research conducted on toddlers in the Manyar Sabrangan Village, Surabaya, in 2017 showed that toddlers who came from food-insecure families were more at risk of stunting (Safitri & Nindya, 2017). Research Aritonang et al. (2020) research results show that children under five who come from food-insecure families are 2.6 times more likely to suffer from stunting.

5. Relationship of Healthy Latrine Ownership with Stunting Incidence

After humans consume food and drink, humans will excrete residual substances in the form of feces (feces) and urine (urine) that are no longer needed by the body. These residual substances can be a source of environmental contamination and disease if they are not accommodated in latrines (Notoatmodjo, 2014).

Households have access to healthy and proper latrines if the latrine facilities used are by health requirements. Among other things, latrines must be free from nuisance animals, such as rats and animals that can spread diseases, such as flies and roaches roaming around. The type of latrine used is a gooseneck. There is a septic tank to accommodate feces and urine so that it does not pollute the surrounding environment and is a source of disease transmission (Kementerian Kesehatan RI, 2016).

Access to sanitation facilities (latrines) that are not following health standards can increase the risk of humans suffering from infectious diseases, especially toddlers, which can cause toddlers to experience wasting and stunting. This is because the energy from nutritious food is not used for toddlers' growth but is used to fight infection and disease, so nutrients are challenging to absorb by the body and stunted growth (Wulandari et al., 2019).

The results showed that latrines were not a determinant of stunting in toddlers in the Noemuti Health Centre working area. This study's results follow research conducted at the Bondowoso Public Health Center, where the results showed that healthy latrine ownership did not affect the growth of toddlers' body length (Sinatrya & Muniroh, 2019). The results of this study contradict the research conducted by Herawati et al. (2020), where the results of the study show that toddlers who come from families that do not have healthy latrines and are following health requirements are more at risk of suffering from stunting.

6. The Relationship of Clean Water Sources With Stunting Incidents

Clean water used for human consumption must be sourced from clean and safe sources or with health requirements. The source of clean water is said to be clean and safe if the source of clean water used for daily consumption is not contaminated with harmful chemicals, E.coli bacteria, and coliforms that cause diarrhea which is the source of diseases that can interfere with growth in toddlers. Clean water must also be clear, tasteless, and smelly and meet the health standards of the World Health Organization (WHO) and/or the Indonesian Ministry of Health. Sources of clean water in Indonesia come from several water sources, including rainwater, surface water (river water), and groundwater. Groundwater is divided into 2, namely shallow well water and deep well water (Sumantri, 2017).

Access to adequate clean water for consumption in developing countries, including Indonesia, is for everyone; which is at least 60 liters/per person/per day and sourced from clean water sources that comply with health standards, namely drinking water sources must be protected so that they are not contaminated by hazardous chemicals such as the Minamata case in Japan and Cobalt poisoning in the US as well as bacteria that are the source of infectious diseases, namely e-coly and coliform bacteria (Sumantri, 2017).

For the source of drinking water consumed to meet health requirements, the water source to be used must be protected so that it is not easily polluted. Sources of drinking water are said to be protected if they meet health requirements, namely if the source of clean water is a pipe, water terminal, rainwater reservoir (PAH), or springs. The source of clean water must have a minimum distance from the pollutant source (garbage bins, latrines, animal pens, and waste storage) of at least 10 meters. If the water source used is a well (bore well or pump), then the construction of the well must comply with health requirements, and the minimum distance from the pollutant source must be at

least 10 meters (garbage bins, latrines, cattle pens, and waste collection sites) (Kementrian Kesehatan RI, 2018a).

The study results show a relationship between the source of clean water used by the community and the incidence of stunting in toddlers in the working area of the Noemuti Health Center in 2021. Based on the observations made during the study on toddlers' homes and the source of clean water used, many households still have water sources the net is not following health requirements, namely as many as 38 households 52.7%.

The results of this study are the results of research conducted on toddlers in the Work Area of the Kerkap Health Center, North Bengkulu Regency, where the results of the study show that toddlers who come from households with access to environmental sanitation and clean water that do not meet health requirements are 3.8 times more at risk to suffer from stunting (Wulandari et al., 2019). The results of a literature study by Septiyani et al. (2021) regarding the relationship between access to clean water following health requirements and drinking water quality by health requirements with the incidence of stunting in children under five in Indonesia, the results of literature study show that 64% of research results in Indonesia stated that access to Household clean water that is not by health requirements has a relationship with the incidence of stunting in toddlers and 78% shows that toddlers who come from families who consume drinking water that does not meet health requirements are more at risk of suffering from stunting.

Sources of drinking water that meet health requirements are essential factors that affect health status and reduce the risk of suffering from various infectious diseases such as diarrhea, cholera, and typhoid (Kementrian Kesehatan RI, 2018a). Infectious diseases such as diarrhea, cholera, and helminthiasis suffered by toddlers are infectious diseases caused by sanitation hygiene that is not by health standards and is also caused by access to clean water that is not by health requirements. Infectious diseases suffered by toddlers

result in non-optimal absorption of nutrients in the digestive process. Nutrition that can be used for the growth and development of toddlers is diverted to fight infectious diseases suffered by toddlers, causing toddlers to become thin (wasting) (Helmyati et al., 2019). This condition will affect linear growth in toddlers, although it also depends on the severity of the illness, the frequency of the illness, and the duration of the illness (Kementrian Kesehatan RI, 2018a).

7. The Relationship of Clean Water Adequacy With Stunting Incidence

Based on health standards, the amount of clean water consumed per person per day is 60 litres/person/day. Lack of sufficient clean water for daily consumption, especially to maintain personal hygiene, namely for bathing, can cause various skin and eye diseases. This can happen because bacteria are always present on the skin and eyes, and if not cleaned with clean water that meets health requirements can develop and cause toddlers to suffer from trachoma and scabies (Soemirat, 2011). Diseases suffered by toddlers can cause toddlers to experience wasting or being underweight because, during a toddler's illness, there is an increase in nutritional needs, which is not balanced with adequate nutritional intake (Helmyati et al., 2019).

The results showed a relationship between the adequacy of clean water and the incidence of stunting in children under five in the working area of the Noemuti Health Center. Based on the results of observations and calculations, most people do not have enough clean water according to health standards; the amount of consumption per person per day is 60 liters. Based on the study's results, 45 respondents (62.6%) did not have enough clean water according to health requirements, while respondents who provided clean water according to health requirements were 27 respondents (37.5%).

This study's results align with the results of research from Sanam et al. (2021), where the results show that stunting is more common in toddlers who come from families with adequate clean water of fewer than 60 liters/per person/day. Toddlers whose adequacy of clean water does not comply with

health requirements will experience a delay in their growth of the toddler's body. This is because 75% of his body weight is filled with water and the toddler's body has a skin size more significant than his body. So it is easier to get dehydrated. Therefore Toddlers need regular fluid intake throughout the day.

Stunting is not only caused by a lack of nutrient intake but also indirectly caused by a lack of clean water availability in terms of quantity. Based on the results of the research by Cumming & Cairncross (2016), which was published, the results of the study show that there is a relationship between the adequacy of clean water and the incidence of stunting in toddlers. The availability and adequacy of clean water are related to the use of water for agriculture which will have an impact on access to and availability of nutritious food.

8. The Relationship Between the Physical Quality of Clean Water and the Incidence of Stunting

Healthy drinking water is drinking water that meets health requirements, both in terms of physical, chemical and biological, as well as radioactivity, so that after consumption, it does not cause disease. The physical quality requirements of drinking water that meet health requirements are precise (colourless), tasteless, and odourless. The bacteriological requirement of water for healthy drinking must be free from all bacteria, especially pathogenic bacteria such as e-coli (Sumantri, 2017).

Consumption of water that does not meet health requirements can increase the risk of infectious diseases in toddlers, such as diarrhea, intestinal worms, and others. Infectious diseases suffered by toddlers, if they occur continuously and are not appropriately handled through the provision of drugs and nutritious food, will cause toddlers to suffer from waste. This wasting condition will affect the linear growth of toddlers, although it also depends on the severity of the disease, the frequency of illness, and the duration of illness (Helmyati et al., 2019).

The results showed a relationship between clean water's physical quality and stunting incidence. The results of this study are contrary to the results of research conducted on toddlers in the working area of the Kotakulon Health Center in 2019, where the results showed that there was no relationship between the physical quality of water and the incidence of stunting in toddlers (Sinatrya & Muniroh, 2019).

9. The Relationship of Mother's Handwashing Habits With Stunting Incidents

The behavior of washing hands using soap and running water is still an essential target of health promotion in Indonesia. This is because washing hands using soap and running water can break the chain of disease transmission from hands that are not clean or have been contaminated with disease sources. An important time for hand washing with soap (CTPS) so that it can break the chain of disease spread, including constantly washing hands with soap before processing and serving food and before eating, before breastfeeding toddlers and feeding babies/toddlers, after defecating/urinating, after handling animals/poultry (Peraturan Menteri Kesehatan Republik Indonesia Nomor 3 Tahun 2014 Tentang Sanitasi Total Berbasis Masyarakat, 2014).

The behavior of washing hands using soap for mothers of toddlers at the right time and using soap and running water can break the chain of transmission of infectious diseases such as diarrhea, typhus, and worms (Maryunani, 2019). Infectious diseases from toddlers, such as diarrhea, cholera, and worms, are infectious diseases caused by sanitation hygiene that does not follow health standards (Zairinayati & Purnama, 2019). This can interfere with growth because there is an inhibition of nutrient absorption in the digestive process and can cause toddlers to experience wasting. This is because there is an increase in nutritional needs when a toddler is sick, which is not balanced with the provision of nutrient-rich foods. Wasting conditions can affect linear growth in toddlers, although the length of illness also influences it, the frequency of

illness, efforts to seek treatment when sick for healing, and optimal nutritional fulfilment (Helmyati et al., 2019).

The study's results showed a relationship between the habit of washing mothers' hands using soap and running water and the incidence of stunting in toddlers in the working area of the Noemuti Health Center. Based on the results of the study showed that most of the respondents did not wash their hands using soap and running water and according to the right time, namely 38 mothers under five (52.8), compared to respondents who washed their hands using soap and running water and according to the correct time namely as many as 34 mothers of children under five (47%). Most mothers of toddlers do not wash their hands using soap and running water, most mothers of toddlers only wash their hands using dishwashing water and running water without soap, and some respondents forget the right time to wash their hands with soap.

The results of this study are in accordance with research conducted at the Krajeng Public Health Center, Probolinggo Regency, in 2019, where the results showed that mothers who did not wash their hands using soap and running water had a risk of 7,500 children suffering from stunting compared to mothers who washed their hands using soap and running water (Sekarsari, 2019). The results of these two studies are in line with the results of research from Adriany et al. (2021), where the results of the study show that there is a relationship between the habit of washing the hands of mothers of toddlers with soap and running water with the incidence of stunting in toddlers.

10. The Relationship Between the History of the Number of *Antenatal Care* Visits with the Incidence of Stunting

Antenatal care services are given to pregnant women four times or more depending on the health problems experienced by pregnant women during pregnancy. Contacts were made four times, namely once before 14 weeks of gestation or in the first trimester, once after 14-28 months of pregnancy or the

second trimester, and twice in the third trimester, namely during 28-36 weeks of pregnancy and after 36 weeks of gestation (Camelia et al., 2020).

Mothers who carry out antenatal care visits according to health standards will receive services and examinations during pregnancy so that health workers can monitor the health of the mother and fetus. The quantity and quality of antenatal care visits following health standards will help health workers know the health problems experienced by pregnant women so that these health problems can be handled and have no impact on the health of the mother and fetus. One of the health problems experienced by pregnant women during pregnancy that can affect fetal growth and is often experienced by pregnant women in Indonesia is anemia during pregnancy (Rahmi, 2019).

Mothers who carry out antenatal care visits according to health standards, then health workers can intervene by providing iron (Fe) supplements to mothers and will also be given counseling materials about food sources of iron that are readily available and affordable and the impact of anemia on pregnancy if not handled.

Anemia experienced by the mother during pregnancy and is not appropriately handled through the consumption of iron supplements and the consumption of iron-rich foods, the mother under five will be more at risk for giving birth to a toddler with low birth weight or giving birth to a premature toddler. Babies with low birth weight and prematurity are determinants of stunting in toddlers (Camelia et al., 2020). This is according to the results of research at a hospital in Tobelo Regency, where the results of the study show that mothers who carry out ANC visits during pregnancy do not meet health requirements or < 4 times, are at risk for giving birth to toddlers with low birth weight (Maulina & Rachmayanti, 2021).

Pregnant women who make complete antenatal care visits during pregnancy will receive services for measuring upper arm circumference to determine the nutritional status of pregnant women. Is the mother experiencing

chronic energy deficiency or not? If the mother experiences chronic energy deficiency, the mother will get additional food for pregnant women (Kementrian PPN/Bappenas, 2018). In addition, mothers will receive counseling materials related to chronic energy deficiency (KEK) and ways to overcome the problem of chronic energy deficiency. Mothers who experience a chronic lack of energy during pregnancy, and are not intervened according to the program from government, will be more at risk of giving birth to toddlers who experience stunting (Camelia et al., 2020).

In addition, if the mother conducts a quantity of ANC visits according to health requirements, the mother will receive information and educational communication materials provided by health workers to mothers that will impact maternal health, especially toddlers who can prevent stunting. Counseling materials include initiation of early and exclusive breastfeeding, postnatal family planning, nutritional problems in the form of Fe tablet supplementation, recommending mothers consume iodized salt, consuming iron-rich and calorie-dense foods, and providing additional food for toddlers.

The results showed a relationship between the history of the quantity of maternal antenatal care visits during pregnancy and the incidence of stunting in children under five. Some respondents did not visit Antenatal Care according to health requirements because they were busy as housewives, the distance between their homes and health facilities was far, they did not receive support from their families, and also some admitted that they knew the condition of their womb without the need for an examination or Antenatal Care visit according to the requirements health.

The results of this study are in line with the results of research from Maulina et al. (2021). The results showed that there was a relationship between incomplete Antenatal Care visits and the incidence of stunting in toddlers, mothers who did not have routine Antenatal Care visits had a 0.360 times higher risk of giving birth to stunting toddlers.

11. Relation of Disease Frequency with Stunting Incident

How many diseases are experienced by toddlers in Indonesia that often occur with a very high prevalence of cases, namely diarrheal diseases, worms, and ARI? These diseases are caused by hygiene and sanitation as well as family-level clean water providers that are not in accordance with health requirements. Some infectious diseases (e.g. diarrhea, cholera, helminthiasis, ARI) suffered by infants can cause toddlers to experience wasting. This can interfere with growth due to inhibiting nutrient absorption in the digestive process and can cause toddlers to experience wasting. This is because there is an increase in nutritional needs when a toddler is sick, which needs to be balanced with the provision of nutrient-rich foods. Wasting conditions can affect linear growth in toddlers. However, the length of illness also influences it, the frequency of illness, efforts to seek treatment when sick for healing, and optimal nutritional fulfillment (Helmyati et al., 2019).

The study results show a relationship between the frequency of illness and the incidence of stunting in toddlers in the working area of the Noemuti Health Center in 2021. The results of this study are in line with the results of the study Dewi and Widari (2018). The results study showed that children under two who had experienced an infectious disease in the last three months were 3.07 more likely to experience stunting.

Conclusion

Based on the results of research on the risk factors for stunting in the work area of the Noemuti Health Center in 2021, it can be concluded that the risk factors for stunting in the Noemuti Health Center work area in 2021, namely birth distance, family food security, clean water adequacy, source of clean water, physical quality of clean water, mother's habit of washing hands using soap and running water, history of quantity of maternal antenatal care visits during pregnancy, and frequency of illness.

Suggestion

The community participates in stunting prevention efforts by paying attention to the availability of hygiene facilities (hand washing facilities), sanitation (ownership of healthy latrines), the availability of clean water that meets health requirements, and taking into account household food security in showing maternal nutrition, especially toddlers in the first 1.000 days of life. It is expected that the local health service unit will provide counseling to the community to check pregnancy during pregnancy at least four times, secondly provide counseling and assist the community in making wells as a source of clean water by health requirements that the community can use**.**

Reference

Adriany, F., Hayana, Nurhapipa, Septiani, W., & Sari, N. P. (2021). Hubungan Sanitasi Lingkungan dan Pengetahuan dengan Kejadian Stunting Pada Balita di Wilayah Puskesmas Rambah. *Jurnal Kesehatan Global*, *4*(1), 17–25. https://doi.org/https://doi.org/10.33085/jkg.v4i1.4767

Aritonang, E. A., Margawati, A., & Dieny, F. F. (2020). Analisis Pengeluaran Pangan, Ketahanan Pangan dan Asupan Gizi Anak Balita (Baduta) Sebagai Faktor Risiko Stunting. *Journal of Nutrition College*, *9*(1), 71–80. https://doi.org/https://doi.org/10.14710/jnc.v9i1.26584

Bickel, G., Nord, M., Price, C., Hamilton, W., & Cook, J. (2000). Guide to Measuring Household Food Security Revised 2000. In *Guide to Measuring Household Food Security Revised 2000* (3rd ed., pp. 1–82). Department of Agriculture, Food and Nutrition Service. https://naldc.nal.usda.gov/download/38369/PDF

Camelia, V., Proborini, A., & Jannah, M. (2020). Hubungan Antara Kualitas dan Kuantitas Riwayat Kunjungan Antenatal Care (ANC) dengan Stunting pada Balita Usia 24-59 Bulan di Kecamatan Pujon Kabupaten Malang. *Journal of Issues in Midwifery*, *4*(3), 100–111. https://doi.org/10.21776/ub.joim.2020.004.03.1

Cicih, Li. H. M. (2019). *Info Demografi* (Issue 2). https://www.bkkbn.go.id/po-content/uploads/info_demo_vol_1_2019_jadi.pdf

Ciompah, F. (2020, September). Warga di TTU Kesulitan Air Bersih. *NTT News.Com*, 1–2. https://www.ntt-news.com/warga-di-ttu-kesulitan-air-bersih/

Cumming, O., & Cairncross, S. (2016). Review Article Can Water, Sanitation and Hygiene Help Eliminate Stunting®? Current Evidence and Policy Implications. *Maternal and Child Nutrition*, *12*, 91–105. https://doi.org/10.1111/mcn.12258

Data Stunting Kabupaten Timor Tengah Utara Tahun 2019. (2019). Dinas Kesehatan Kabupaten Timor Tengah Utara.

Dewi, N. T., & Widari, D. (2018). Hubungan Berat Badan Lahir Rendah dan Penyakit Menular dengan Kejadian Stunting di Baduta Desa Maron Kidul Kecamatan Maron Kabupaten Probolinggo. *Amerta Nutrition*, *2*(4), 373–381. https://doi.org/10.20473/amnt.v2i4.2018.373-381

Dinas Kesehatan Kabupaten Timor Tengah Utara. (2019). *Profil Kesehatan Kabupaten Timor Tengah Utara 2019*.

Haris, A., Fitri, A., & Kalsum, U. (2019). Determinan Stunting dan Underweight Pada Balita Suku Anak Dalam Desa Nyogan Kabupaten Muaro Jambi Tahun 2019. *Jurnal Kesehatan Masyarakat Jambi (JKMJ)*, *3*(1), 41–53. https://doi.org/https://doi.org/10.22437/jkmj.v3i1.7598

Helmyati, S., Atmaka, D. R., Wisnusanti, S. U., & Wigati, M. (2019). *Stunting Permasalahan dan Penanganan* (Sifa (Ed.); Pertama, pp. 1–157). Gadjah Mada University Press.

Herawati, Anwar, A., & Setyowati, D. L. (2020). Hubungan Sarana Sanitasi, Perilaku Penghuni, dan Kebiasaan Cuci Tangan Pakai Sabun (CTPS) oleh Ibu dengan Kejadian Pendek (Stunting) pada Batita Usia 6-24 Bulan di Wilayah Kerja Puskesmas Harapan Baru, Samarinda. *Jurnal Kesehatan Lingkungan Indonesia*, *19*(1), 7–15. https://doi.org/10.14710/jkli.19.1.7-15

Peraturan Menteri Kesehatan Republik Indonesia Nomor 3 Tahun 2014 tentang Sanitasi Total Berbasis Masyarakat, Pub. L. No. 3 (2014). https://peraturan.bkpm.go.id/jdih/userfiles/batang/Permenkes_3_2014.pdf

Kementerian Kesehatan RI. (2016). Pusat Data dan Informasi Kementrian Kesehatan RI. In *Situasi Balita Pendek di Indonesia*. https://pusdatin.kemkes.go.id/folder/view/01/structure-publikasi-pusdatin-info-datin.html

Kementerian Kesehatan RI. (2018). Laporan Riset Kesehatan Dasar Tahun 2018. In *Kementerian Kesehatan RI*. http://www.yankes.kemkes.go.id/assets/downloads/PMK No. 57 Tahun 2013 tentang PTRM.pdf

Kementrian Kesehatan RI. (2018a). Buletin Stunting. In *Kementerian Kesehatan RI*. Kementrian Kesehatan RI. https://www.google.com/search?q=buletin+stunting&oq=bulet&aqs=chrome.1.

69i57j35i39j0i433j0l2j69i60l3.4026j0j7&sourceid=chrome&ie=UTF-8#

Kementrian Kesehatan RI. (2018b). Riset Kesehaatan Dasar Tahun 2018. In *Kementrian Kesehatan RI*. http://labdata.litbang.kemkes.go.id/images/download/laporan/RKD/2018/Laporan_Nasional_RKD2018_FINAL.pdf

Kementrian Kesehatan RI. (2019). Profil Kesehatan Indonesia Tahun 2019. In *Kementrian Kesehatan RI*. https://pusdatin.kemkes.go.id/resources/download/pusdatin/profil-kesehatan-indonesia/Profil-Kesehatan-indonesia-2019.pdf

Kementrian PPN/Bappenas. (2018). Pedoman Pelaksanaan Intervensi Penurunan Stunting Terintegrasi Di Kabupaten/ Kota. In *Kementerian Perencanaan dan Pembangunan Nasional/ Badan Perencanaan dan Pembangunan Nasional*. http://tnp2k.go.id/filemanager/files/Rakornis 2018/Pedoman Pelaksanaan Intervensi Penurunan Stunting Terintegrasi Di Kabupaten Kota.pdf

Laili, A. N. (2018). Analisis Determinan Kejadian Stunting pada Balita (Studi di Wilayah Kerja Puskesmas Sumberjambe, Puskesmas Kasiyan, dan Puskesmas Sumberbaru Kabupaten Jember [Universitas Jember]. In *Repository.Unej.Ac.Id*. https://repository.unej.ac.id/bitstream/handle/123456789/85863/Ayik Nikmatul Laili-152520102027 %23.pdf?sequence=1

Maryunani, A. (2019). *Perilaku Hidup Bersih dan Sehat (PHBS)* (1st ed.). CV.Trans Info Media.

Maulina, C., & Rachmayanti, R. D. (2021). Risk Factors for Stunting under Two-Year-Old Children in Surabaya. *Jurnal Promosi Kesehatan Indonesia*, *16*(1), 1–6. https://doi.org/10.14710/jpki.16.1.1-6

North Central Timor District Health Office. (2018). *2018 North Central Timor District Stunting Data*.

Notoatmodjo, S. (2014). *Kesehatan Masyarakat* (Revisi). PT Rineka Cipta.

Nubabi, I. E. (2020). *Laporan Pelaksanaan Magang di Wilayah Kerja Puskesmas Noemuti Kabupaten TTU Tahun 2020*.

Olo, A., Mediani, H. S., & Windy, R. (2021). Hubungan Faktor Air dan Sanitasi dengan Kejadian Stunting pada Balita di Indonesia. *Jurnal Obsesi : Jurnal Pendidikan Anak Usia Dini*, *5*(2), 1113–1126. https://doi.org/10.31004/obsesi.v5i2.521

Pongrekun, P. S., Sunarsih, & Fatmawati. (2020). Faktor-Faktor Yang Berhubungan Dengan Kejadian Stunting di Kabupaten Konawe Selatan. *Jurnal Ilmiah Kebidanan*, *6*(2), 95–104.

http://journal.stikespemkabjombang.ac.id/index.php/jikeb/article/view/514

Rahmi, U. (2019). Faktor yang Berhubungan dengan Kejadian Anemia pada Ibu Hamil Trimester III di Puskesmas Langsa Barat Kota Langsa Tahun 2019 [Medan Helvitia Institute of Health]. In *Repository institut Kesehatan Helvitia*. http://repository.helvetia.ac.id/2745/6/SKRIPSI ULFA RAHMI 1801032129%281%29.pdf

Safitri, C. A., & Nindya, T. S. (2017). Hubungan Ketahanan Pangan dan Penyakit Diare dengan Stunting pada Balita 13-48 Bulan di Kelurahan Manyar Sabrangan, Surabaya. *Amerta Nutrition*, *1*(2), 52–61. https://doi.org/10.20473/amnt.v1i2.6226

Sanam, S. M., Manurung, I., & Purnawan, S. (2021). Pemetaan Kejadian Stunting di Wilayah Kerja Puskesmas Bati Berdasarkan Ketersediaan Air Bersih. *Media Kesehatan Masyarakat*, *3*(2), 119–127. https://doi.org/https://doi.org/10.35508/mkm

Sekarsari, A. A. (2019). Hubungan Higiene Sanitasi Lingkungan dengan Penyakit Menular Penyebab Kejadian Stunting di Wilayah Kerja Puskesmas Krejengan Kabupaten Probolinggo Tahun 2019. [Universitas AirlanggaUniversity]. In *Universitas Airlangga*. http://repository.unair.ac.id/95035/

Septiyani, W., Sulistiyani, S., & Joko, T. (2021). Literature Study: Relationship Of Access To Clean Water And Drinking Water Quality With Stunting In Toddlers 2010-2020. *International Journal of Health, Education and Social (IJHES)*, *4*(1), 1–18. https://doi.org/https://doi.org/10.1234/ijhes.v4i1.130

Sinatrya, A. K., & Muniroh, L. (2019). Hubungan Faktor Water, Sanitation, and Hygiene (WASH) dengan Stunting di Wilayah Kerja Puskesmas Kotakulon, Kabupaten Bondowoso. *Amerta Nutrition*, *3*(3), 164–170. https://doi.org/10.2473/amnt.v3i3.2019.164-170

Soemirat, J. (2011). *Kesehtan Lingkungan* (8th ed.). UGM Press.

Sumantri, A. (2017). *Kesehatan lingkungan* (4th ed.). Kencana.

Tsaralatifah, R. (2020). Faktor yang Berhubungan dengan Kejadian Stunting pada Baduta di Kelurahan Ampel Kota Surabaya. *Amerta Nutrition*, *4*(2), 171–177. https://doi.org/10.20473/amnt.v4i2.2020.171-177

Usboko, P. (2020, October). Atasi Kekeringan dan Kerawanan Pangan di TTU, Rakor Pemkab Bersama Camat. *Timor Express*, 1.

Wulandari, Rahayu, F., & Darmawansyah. (2019). Hubungan Sanitasi Lingkungan dan Riwayat Penyakit Infeksi Dengan Kejadian Stunting di Wilayah Kerja Puskesmas Kerkap Kabupaten Bengkulu Utara. *Avicenna*, *14*(02), 6–13.

https://doi.org/10.36085/avicenna.v14i02.374

Zairinayati, & Purnama, R. (2019). Hubungan Hygiene Sanitasi dan Lingkungan dengan Kejadian Stunting Pada Balita. *Jurnal Ilmiah Multi Science Kesehatan*, *10*(1), 78–91. http://jurnal.stikes-aisyiyah-palembang.ac.id/index.php/Kep/article/view/186