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Original Research Article

Does the Nutritional Status of Stunted Toddlers have a Correlation with their Dietary Diversity and Clean Water Sources?

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Abstract: ***Background:*** Consumption of a diverse diet and having an improved source of clean water are important factors that can help prevent stunting. Most toddlers both in Indonesia and in East Nusa Tenggara Province have a lack of dietary diversity and consumed clean water from unimproved sources. These conditions affect the nutritional status of toddlers and can have a long impact if not immediately treated. ***Aim:*** To analyze the correlation between dietary diversity and source of clean water consumed with nutritional status of stunted toddlers in Kupang Regency. ***Methods:*** This research uses secondary data were collected by Community Care Network Foundation and Danone Institute which came from Tesabela, Bolok, Lifuleo and Sumlili Village. This research used a cross sectional study with a restrospective approach. Total research data was 70 data obtained with a total sampling technique used the inclusion criteria, data stunted toddlers aged 12-59 months and data stunted toddlers from Community Care Network Foundation and Danone Institute that are complete according to the researcher's needs and the exclusion criteria, incomplete data Community Care Network Foundation and Danone Institute. Data dietary diversity and clean water sources consumed by subjects were analyzed using rho spearman test. ***Results:*** There is a significant correlation between dietary diversity and source of clean water consumed with nutritional status of stunted toddlers as indicated by a significance value of $p < 0.001$ with a positive or unidirectional correlation. ***Conclusion:*** There is a significant correlation between dietary diversity and source of clean water consumed with nutritional status of stunted toddlers in Kupang Regency.

Keyword: Dietary diversity, water sources, nutritional status, stunting, toddler.

INTRODUCTION

Stunting is caused by several factors. According to the United Nations Children's Fund (UNICEF) Undernutrition Conceptual Framework, stunting is caused by direct causes, underlying causes, and basic causes (Septikasari, 2018; Vaivada *et al*., 2020). Research by Ngassa *et al*., (2022) found that there was a significant relationship between diverse food consumption and access to clean water with stunting. This is in line with the results of research by Sié *et al*., (2018) showing that increasing dietary diversity can reduce the burden of stunting and chronic malnutrition. The results of Nakamura & Kondo, (2021) also show that access to safe drinking water is very important to improve children's nutritional status. The results of Rahayu *et al*., (2018) also suggest that there is no relationship between access to clean drinking water sources and the incidence of stunting.

Based on data presented by UNICEF, only 31% of children globally are fed according to minimum dietary diversity indicators (UNICEF, 2022). Based on primary health research (Riskesdas) data in 2018, around 46.6% of children aged 6-23 months in Indonesia consume diverse foods (Kemenkes, 2018). In East Nusa Tenggara (NTT) Province, there were only 26.3% of children aged 6-23 months who had consumed a diverse diet, reflecting the low consumption of diverse foods

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among toddlers in NTT and in Indonesia (Riskesdas, 2019). As for access to clean water, globally there are still 144 million people who still use water from surface water sources without treatment (UNICEF) & WHO, 2019). Nationally, 93% of households in Indonesia have consumed drinking water from access to safe drinking water. However, based on regional characteristics, East Nusa Tenggara Province is one of the provinces with households that use more unsafe drinking water with a proportion of 10.7%, which is higher than the proportion of unsafe drinking water in Indonesia which is only 7% (Irianto, 2020).

The results of a study conducted by Hintsa & Gereziher, (2019) stated that children who did not meet the minimum food diversity score were 4.57 times more likely to be underweight, which could affect the nutritional status of toddlers. In addition, previous research on "A review of child stunting determinants in Indonesia" conducted by Beal *et al*., (2018) showed that poor drinking water quality is one of the causes of malnutrition in children. Nakamura & Kondo, (2021) also mentioned that access to unclean and unsafe water and inadequate hygiene and sanitation practices can lead to chronic bacterial infections, which prevent the body from absorbing nutrients.

Based on the description that had been presented, the researchers were interested in analyzing the correlation between dietary diversity and sources of clean water consumed with the nutritional status of stunted toddlers in Kupang Regency. This study is a part of an umbrella research entitled the effect of specific and sensitive nutrition interventions on the nutritional status of children under five in Kupang District. This study used secondary data from the Indonesian Community Care Network Foundation with data collection locations coming from 4 Gasing Nekmese villages in West Kupang District, namely Tesabela Village, Bolok Village, Lifuleo Village and Sumlili Village.

MATERIAL AND METHODS

This study was conducted in July-September 2023 using secondary data from the Indonesian Community Care Network Foundation intervention results with data collection locations from 4 Gasing Nekmese villages in West Kupang District, namely Tesabela, Bolok, Lifuleo and Sumlili Village. This research is a non-experimental research design that used cross sectional study design with a restrospective approach.

The population in this study were all data stunted toddlers in 4 villages of Gasing Nekmese, West Kupang District, Kupang Regency, namely Tesabela Village, Bolok Village, Sumlili Village and Lifuleo Village with the amount of data that was recorded by the Indonesian Community Care Network Foundation as much as 101 data. The sample data of the research was taken with Total sampling method using purposive sampling technique and obtained sample data as much as 70 data.

This research began with collecting research population data from secondary data from the Indonesian Community Care Network Foundation, followed by sorting out research samples according to the inclusion and exclusion criteria. The inclusion criteria in this study are data on stunted toddlers aged 12-59 months and the Indonesian Community Care Network Foundation survey data related to stunted toddlers that are complete according to the needs of researchers, while the exclusion criteria in this study are incomplete data from Indonesian Community Care Network Foundation.

From the results of sorting the secondary data of Indonesian Community Care Network Foundation, there was 70 data on stunted toddlers that met the inclusion and exclusion criteria. Then, weight and height data of 70 stunted toddlers were collected based on secondary data from posyandu at 4 villages in west Kupang District and used to determine the nutritional status of stunted toddlers based on BB/U, BB/TB and IMT/U indicators. The dietary diversity and clean water sources consumed by the 70 stunted toddlers were also collected using secondary data from Indonesian Community Care Network Foundation. The results of data collection were analyzed with statistical data processing software with univariate analysis and bivariate analysis using the Rho spearman test according to the research objectives.

RESULTS

Respondent Characteristics

This study took secondary data with the research subject is stunted toddler data from 4 villages in West Kupang District with the characteristics of the subject data including the village location of toddlers, gender, age and nutritional status of stunted toddlers. The characteristics of the subject data can be seen in table 1 below.

Table 1: Respondent Characteristics Data

Characteristics	Frequency (N = 70)	Percentage (%)
Village location		
• **Tesabela**	15	21,4
• **Bolok**	36	51,4
• **Lifuleo**	5	7,1
• **Sumlili**	14	20

Characteristics	Frequency (N = 70)	Percentage (%)
Gender		
• **Male**	44	62,9
• **Female**	26	37,1
Age (Month)		
• **12-23**	22	31,4
• **24-35**	23	32,9
• **36-47**	17	24,3
• **48-59**	8	11,4
Nutritional status based on BB/U		
• **Severely underweight**	13	18,6
• **underweight**	31	44,3
• **Normal**	27	37,1
• **Risk of Overweight**	0	0
Nutritional status based on BB/PB atau BB/TB		
• **Severly wasted**	3	4.3
• **Wasted**	21	30
• **Normal**	44	62,9
• **Possible risk of overweight**	0	0
• **Overweight**	2	2,9
• **Obese**	0	0
Nutritional status based on IMT/U		
• **Severly wasted**	0	0
• **Wasted**	18	25,7
• **Normal**	48	68,9
• **Possible risk of overweight**	3	4,3
• **Overweight**	0	0
• **Obese**	1	1,4

The data presented in Table 1 shows that the majority of stunted toddlers came from Bolok Village (51.4%). The number of male stunted toddlers was more dominant with a percentage of 62.9% and the number of female stunted toddlers was 37.1%. Based on the toddler age range distributed at the age of 12-59 months, the most age range of stunted toddlers is the age of 24-35 months at 32.9%. The data presented in Table 1 also shows that based on the BB/U Z-score index, underweight subjects dominate with a percentage of 44.3%. While based on the BB/TB Z-score index, the condition of nutritional status is dominated by subjects with normal nutritional status (62.9%) which is in line with the condition of nutritional status based on the IMT/U Z-score index that was dominated by subjects with good nutritional status as many as 48 subjects (68.9%).

Descriptive Analysis

Table 2 Overview of food groups consumed

Food group	Consumtion		No Consumtion	
	Frequency (N = 70)	Percentage (%)	Frequency (N = 70)	Percentage (%)
Grains, roots, and tubers	70	100	0	0
Legumes and nuts	58	82,9	12	17,1
Dairy products	18	25,7	47	67,1
Meat, fish, poultry, and liver/organ meats	58	82,9	12	17,1
Eggs	58	82,9	12	17,1
Vitamin A rich fruits and vegetables	0	0	70	100
Other fruits and vegetables	41	58,6	29	41,4

Table 2 shows the food consumption of stunted toddlers from 7 food groups based on the Infant and Young Children Feeding Practice (IYCF) guidelines from WHO. All toddlers (100%) consumed food ingredients from Grains, roots, and tubers such as rice, corn, sorghum, potatoes, sweet potatoes, cassava, bread, noodles and porridge. A total of 58 stunted toddlers (82.9%) consumed food ingredients from Legumes or nuts (beans, red beans, tofu, tempeh), meat, fish, poultry, liver/organ meats and eggs also there were 41 stunted

toddlers (58.6%) who consumed other fruits and vegetables that were not classified as fruits and vegetables rich in vitamin A. However, all toddlers (100%) did not consume food ingredients from fruits and vegetables rich in vitamin A and there were 47 stunted toddlers (67.1%) who did not consume food ingredients from dairy products such as infant formula, cheese or yogurt.

Table 3: Overview of Food Diversity Levels Consumed

Food Diversity Levels	Frequency (N = 70)	Percentage (%)
Low dietary diversity	12	17,1
High dietary diversity	58	82,9

From the results shown in Table 3, it is obtained that diverse food consumption in stunted toddlers with high dietary diversity (82.9%) is more dominant than the lower dietary diversity (17.1%). Subjects are categorized as high dietary diversity if they consume at least 4 of the 7 food groups.

Table 4: Source of Clean Water Consumed

Source of Clean Water	Frequency (N = 70)	Percentage (%)
Piped water	7	10
Borehole well	12	17,1
Dug well	12	17,1
Public tap	2	2,9
Packaged or delivered water	25	35,7
Open spring	12	17,1

Based on table 4, it is known that packaged or delivered water is the most widely source of clean water used by stunting toddlers with a percentage of 35.7%. While the least source of clean water used is public taps (2.9%).

Table 5 Categories of Clean Water Sources Consumed

Categories	Frequency (N = 70)	Percentage (%)
Improved	58	82,9
Unimproved	12	17,1

The overview of the results shown in table 5 shows that subjects with improved clean water sources dominate with a percentage of 82.9% compared to unimproved clean water sources at 17%.

Table 6 Cross-tabulation of Subject Data Characteristics with Dietary Diversity and Clean Water Source

Characteristics	Dietary diversity				Clean water source			
	Low dietary diversity		High dietary diversity		Improved		unimproved	
	N = 70	%	N = 70	%	N = 70	%	N = 70	%
Village location								
• Tesabela	13	86,7	2	13.3	13	86,7	2	13.3
• Bolok	31	86,1	5	13,9	31	86,1	5	13,9
• Lifuleo	5	100	0	0	5	100	0	0
• Sumlili	9	64,3	5	35,7	9	64,3	5	35,7
Gender								
• Male	37	84.1	7	15,9	37	84.1	7	15,9
• Female	21	80,8	5	19,2	21	80,8	5	19,2
Age (Month)								
• 12-23	14	63,6	8	36,4	14	63,6	8	36,4
• 24-35	20	87	3	13	20	87	3	13
• 36-47	17	100	0	0	17	100	0	0
• 48-59	7	87,5	1	12,5	7	87,5	1	12,5
Nutritional status based on BB/U								
• Severely underweight	1	7,7	12	92,3	1	7,7	12	92,3
• underweight	31	100	0	0	31	100	0	0
• Normal	26	100	0	0	26	100	0	0
• Risk of Overweight	0	0	0	0	0	0	0	0

Characteristics	Dietary diversity				Clean water source			
	Low dietary diversity		High dietary diversity		Improved		unimproved	
	N = 70	%	N = 70	%	N = 70	%	N = 70	%
Nutritional status based on BB/PB atau BB/TB								
• Severly wasted	0	0	3	100	0	0	3	100
• Wasted	12	57,1	9	42,9	12	57,1	9	42,9
• Normal	44	100	0	0	44	100	0	0
• Possible risk of overweight	0	0	0	0	0	0	0	0
• Overweight	2	100	0	0	2	100	0	0
• Obese	0	0	0	0	0	0	0	0
Nutritional status based on IMT/U								
• Severly wasted	0	0	0	0	0	0	0	0
• Wasted	8	44,4	10	55,6	8	44,4	10	55,6
• Normal	46	95,8	2	4,2	46	95,8	2	4,2
• Possible risk of overweight	3	100	0	0	3	100	0	0
• Overweight	0	0	0	0	0	0	0	0
• Obese	1	100	0	0	1	100	0	0

The results of the cross tabulation in Table 6 show that consumption of diverse foods and proper clean water sources are dominated by stunted toddlers from Bolok Village (86.1%). Stunted toddlers who are male (84.1%) dominate in having a high dietary diversity and dominant in having an improved clean water source. Lower dietary diversity and unimproved clean water sources were dominated by stunted toddlers aged 12-23 months at 36.4%. Based on the BB/U indicator, stunted toddlers who have low dietary diversity and unimproved clean water sources are more dominant in having very underweight (92.3%). Based on the BB/PB or BB/TB indicators, stunted toddlers who have a high dietary diversity and having an improved clean water source are 100% well-nourished. In line with the IMT/U indicator, stunted toddlers who have a high dietary diversity and having an improved clean water sources have good nutritional status (95.8%).

Bivariate Analysis

Parametric tests were done by spearman rho test to analyze the correlation between dietary diversity and source of clean water consumed with nutritional status of stunted toddlers in kupang district. The rho spearman test results were significant ($p < 0.01$) in both variables with a p value < 0.001.

Table 7: Spearman Rho Test Results of the correlation between dietary diversity and source of clean water consumed with nutritional status of stunted toddlers

	BB/U		BB/TB		IMT/U		*P*
	N	r	N	r	N	r	
Dietary diversity	70	0.694	70	0.648	70	0.568	**<0.001***
Clean water source	70	0.694	70	0.648	70	0.568	

Noted: *: Spearman rho test (Significant correlation at 0.01 level)

DISCUSSION

The results of the Rho Spearman test in table 7 show a value of $p < 0.001$ which means that there is a significant correlation ($p < 0.01$) between dietary diversity consumed and nutritional status of stunted toddlers in Kupang district. From the results of the Rho Spearman test also obtained a correlation coefficient (r) value 0.694 for BB/U, 0.648 for BB/TB and 0.568 for IMT/U which means that the strength of the correlation between dietary diversity with nutritional status based on BB/U, BB/TB and IMT/U is strong with a positive or unidirectional relationship (if variable X increases then variable Y will also increase).

The results are similar to the research of Aboagye *et al*., (2021) who also found that there is a significant relationship between dietary diversity and the nutritional status of toddlers based on the indicators of BB/U, and BB/TB. Research conducted by Ismail *et al*., (2020) also showed the result that there is a positive relationship between dietary diversity and nutritional status based on IMT/U indicators. An increase in a diverse diet will provide children with adequate nutrition according to their needs and significantly reduce the possibility of underweight and wasting in children (Aboagye *et al*., 2021). Individuals who consume a diverse diet are believed to have better fulfillment of various macro and micronutrients, and can improve nutritional status (Weerasekara *et al*., 2020).

The correlation between dietary diversity and nutritional status based on the indicators of BB/U, BB/TB and IMT/U shows that nutritional intake in stunted toddlers with poor nutritional status tends to be lower than the nutritional intake in stunted toddlers who have normal nutritional status. Low and limited intake of macro and micronutrients can lead to unmet nutritional needs of toddlers, allowing toddlers to have a nutritionally deficient status (Prasetyo *et al*., 2023). Toddlers who are in the growth and development phase certainly require varied nutritional intake according to the growth stage. Therefore, it is expected that eating a variety of foods will help meet nutritional needs because no one type of food contains all nutrients (Gonete *et al.,* 2020).

Low consumption of diverse foods increases the risk of malnutrition including underweight, stunting and wasting. In addition to impairing physical development, a lack of diverse food consumption makes a person more susceptible to and exacerbates diseases, causing mental retardation, blindness, and a general loss of productivity and potential (Le *et al*., 2023; Molla *et al*., 2022).

In this study, researchers also conducted the Rho Spearman test between clean water sources and nutritional status of stunted toddlers based on BB/U, BB/TB and IMT/U and produced a value of $p < 0.001$ which means that there is a significant correlation ($p < 0.01$) between clean water sources consumed with the nutritional status of stunted toddlers in kupang district. The statistical test results also obtained a correlation coefficient (r) value 0.694 for BB/U, 0.648 for BB/TB and 0.568 for IMT/U. The correlation coefficient value obtained shows that the source of clean water with the nutritional status of stunting toddlers based on BB/U, BB/TB and IMT/U has a strong relationship with a positive or unidirectional relationship (if variable X increases then variable Y will also increase).

This result are in line with research conducted by Farooq et al., (2020), found that there is a correlation between improved water sources with nutritional status based on the BB/U indicator. Clean water sources reduce the risk of underweight or in other words have an impact on nutritional status (Farooq *et al*., 2020). The results of Nakamura & Kondo, (2021) research also found that access to clean and proper drinking water increased the BB/TB Z-score by 0.275 standard deviations. This shows that children who have access to proper drinking water have a significantly higher BW Z-score compared to children who do not have access (Nakamura & Kondo, 2021). In addition, research conducted by Thompson *et al*., (2020) found that access to clean water is associated with a healthier BMI. The availability of access to clean water may lead to an increase, albeit small, in BMI/U Z-score which may also be due to a decrease in the incidence of diarrhea (Thompson *et al*., 2020).

The strong and unidirectional correlation between clean water sources and the nutritional status of stunted toddlers illustrates that unimproved water sources tend to be more prevalent in stunted toddlers with poor nutritional status compared to stunted toddlers with normal nutritional status. This is in line with research conducted in northwestern Ethiopia, which says that subjects who drink from unprotected/unsafe drinking water sources are twice as likely to be malnourished compared to subjects who drink from safe water sources (Tebeje *et al*., 2022). Malnutrition experienced is caused by infections such as diarrheal diseases. Therefore, easy access to clean, safe water sources is an important determinant of reducing malnutrition (Chattopadhyay *et al*., 2019; Mengesha *et al*., 2021).

Water is important for the body, but even more important is clean water. Using water from unsafe sources can lead to a number of waterborne diseases such as cholera and diarrhea. This is due to the presence of a number of infectious agents detrimental to human health that grow in the water either by animals or by humans themselves (Khalifa & Bidaisee, 2018). Infectious diseases caused by lack of access to clean water can lead to malnutrition because the parasites interfere with the digestive process by competing with the host for nutrients and inhibiting the absorption of nutrients, resulting in compromised immunity and impacting the nutritional status of the individual (Shrestha *et al*., 2020).

DISCLAIMER

The opinions and results of the analysis in this research are purely the opinions and/or results of the researcher's personal analysis without any other purpose from the Indonesian Community Care Network Foundation as the data owner. Researchers also did not receive any kind of reward from the Indonesian Community Care Network Foundation.

CONCLUSION

1. There is a significant correlation ($p < 0.01$) between the dietary diversity and nutritional status of stunted toddlers in Kupang Regency as indicated by a significance value of $p < 0.001$ and has a positive or unidirectional relationship.
2. There is a significant correlation ($p < 0.01$) between the source of clean water consumed and nutritional status of stunted toddlers in Kupang Regency, which is indicated by a significance value of $p < 0.001$ and has a positive or unidirectional relationship.
3. Based on the survey data from Indonesian Community Care Network Foundation, 12 stunted toddlers (17.1%) consume a less diverse diet and 58 stunted toddlers (82.9%) have consumed a fairly diverse diet.
4. Based on the survey data from the Indonesian Community Care Network Foundation, 12 stunted toddlers (17.1%) have a unimproved clean water

sources and 58 stunted toddlers (82.9%) have an improved clean water sources.

5. Based on the classification of the BB/U Z-score, 13 subjects (18.6%) had severely underweight with Z-score < -3.0, 31 subjects (44.3%) had underweight with Z-score ≥ -3.0 to Z-score < -2.0, and 27 subjects (37.1%) had normal weight with Z-score ≥ -2.0 to Z-score ≤ +1.0.
6. Based on the classification of the BB/PB or BB/TB Z-score, there were 3 subjects (4.3%) classified as severely wasted with Z-score < -3.0, 21 subjects (30%) classified as wasted with Z-score ≥ -3.0 to Z-score < -2.0, 44 subjects (62.9%) classified as normal with Z-score ≥ -2.0 to Z-score ≤ +1.0, and 2 (2.9%) subjects classified as overweight with Z-score > +2.0 to Z-score ≤ +3.0.
7. Based on the IMT/U Z-score index classification, 18 subjects (25.7%) were classified as wasted with Z-score ≥ -3.0 to Z-score < -2.0, 48 subjects (68.9%) were classified as normal with Z-score ≥ -2.0 to Z-score ≤ +1.0, 3 subjects (4.3%) were classified as possible risk of overweight with Z-score > +1.0 to Z-score ≤ +2.0 and there was 1 subject (1.4%) classified as obese with Z-score > +3.0.

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REFERENCE

- Aboagye, R. G., Seidu, A.-A., Ahinkorah, B. O., Arthur-Holmes, F., Cadri, A., Dadzie, L. K., Hagan Jr, J. E., Eyawo, O., & Yaya, S. (2021). Dietary diversity and undernutrition in children aged 6–23 months in Sub-Saharan Africa. *Nutrients*, *13*(10), 3431.
- Beal, T., Tumilowicz, A., Sutrisna, A., Izwardy, D., & Neufeld, L. M. (2018). A review of child stunting determinants in Indonesia. In *Maternal and Child Nutrition* (Vol. 14, Issue 4). Blackwell Publishing Ltd. https://doi.org/10.1111/mcn.12617
- Chattopadhyay, A., Sethi, V., Nagargoje, V. P., Saraswat, A., Surani, N., Agarwal, N., Bhatia, V., Ruikar, M., Bhattacharjee, S., & Parhi, R. N. (2019). WASH practices and its association with nutritional status of adolescent girls in poverty pockets of eastern India. *BMC Women's Health*, *19*(1), 1–13.
- Farooq, R., Khan, H., Khan, M. A., & Aslam, M. (2020). Socioeconomic and demographic factors determining the underweight prevalence among children under-five in Punjab. *BMC Public Health*, *20*(1), 1–11.
- Gonete, K. A., Tariku, A., Wami, S. D., & Akalu, T. Y. (2020). Dietary diversity practice and associated factors among adolescent girls in Dembia district, northwest Ethiopia, 2017. *Public Health Reviews*, *41*(1), 1–13.
- Hintsa, S., & Gereziher, K. (2019). Determinants of underweight among 6-59 months old children in Berahle, Afar, North East Ethiopia: a case control study 2016. *BMC Research Notes*, *12*(1). https://doi.org/10.1186/s13104-019-4805-z
- Irianto, J. dkk. (2020). *STUDI KUALITAS AIR MINUM RUMAH TANGGA DI INDONESIA* (Doddy Izwardi, Sri Irianti, Bambang Setiaji, Ely Setyawaty, & Lidwina Salim, Eds.). Kementrian Kesehatan RI.
- Ismail, A., Darling, A. M., Mosha, D., Fawzi, W., Sudfeld, C., Sando, M. M., Abdallah Noor, R., Charles, J., & Vuai, S. (2020). Prevalence and risk factors associated with malnutrition among adolescents in rural Tanzania. *Tropical Medicine & International Health*, *25*(1), 89–100.
- Kemenkes, R. I. (2018). RISKESDAS 2018. *Jakarta: Kemenkes RI*.
- Khalifa, M., & Bidaisee, S. (2018). The Importance of Clean Water. *Scholar Journal of Applied Sciences and Research*, *1*(7), 17–20. www.innovationinfo.org
- Le, H. N., Nguyen, K. V., Phung, H., Hoang, N. T. D., Tran, D. T., & Mwanri, L. (2023). Household Dietary Diversity among the Ethnic Minority Groups in the Mekong Delta: Evidence for the Development of Public Health and Nutrition Policy in Vietnam. *International Journal of Environmental Research and Public Health*, *20*(2). https://doi.org/10.3390/ijerph20020932
- Mengesha, A., Hailu, S., Birhane, M., & Belay, M. M. (2021). The prevalence of stunting and associated factors among children under five years of age in southern Ethiopia: community based cross-sectional study. *Annals of Global Health*, *87*(1).
- Molla, W., Mengistu, N., Madoro, D., Assefa, D. G., Zeleke, E. D., Tilahun, R., Bayisa, Y., Meshesha, M. D., Ayele, G. M., Kabthyme, R. H., Alemu, A., Eshetu, M. A., Shumye, S., Funga, M. L., Eritero, A. C., Aregawi, S., Wodaynew, T., Muche, T., & Wudneh, A. (2022). Dietary diversity and associated factors among lactating women in Ethiopia: Cross sectional study. *International Journal of Africa Nursing Sciences*, *17*. https://doi.org/10.1016/j.ijans.2022.100450
- Nakamura, R., & Kondo, T. (2021). Assessing the Effects of Access to Safe Drinking Water on Children's Nutritional Status in Indonesia. *Asian Journal of Agriculture and Development*, *18*(2), 55–72. https://doi.org/10.37801/ajad2021.18.2.4
- Ngassa, A. B., Meriki, H. D., Mbanga, C. M., Nzefa, L. D., Mbhenyane, X., & Tambe, A. B. (2022). Key predictors of undernutrition among children 6–59 months in the Buea Health District of the Southwest region of Cameroon: a cross sectional community-based survey. *BMC Nutrition*, *8*(1), 1–17.
- Prasetyo, A., Davidson, S. M., & Sanubari, T. P. E. (2023). Correlation between Individual Dietary Diversity and Children 2-5 Years Old Nutrition

Status in Batur Village, Getasan Regency, Semarang District. *Amerta Nutrition*, *7*(3).

- Rahayu, R. M., Pamungkasari, E. P., & Wekadigunawan, C. S. P. (2018). The Biopsychosocial Determinants of Stunting and Wasting in Children Aged 12-48 Months. *Journal of Maternal and Child Health*, *3*(2), 105–118.
- Riskesdas, T. (2019). RISKESDAS 2018 LAPORAN PROVINSI NTT. *Badan Penerbit BALITBANGKES*.
- Septikasari, M. S. ST., M. (2018). *STATUS GIZI ANAK DAN FAKTOR YANG MEMPENGARUHI* (S. Amalia, Ed.; 1st ed.). UNY Press.
- Shrestha, A., Six, J., Dahal, D., Marks, S., & Meierhofer, R. (2020). Association of nutrition, water, sanitation and hygiene practices with children's nutritional status, intestinal parasitic infections and diarrhoea in rural Nepal: A cross-sectional study. *BMC Public Health*, *20*(1). https://doi.org/10.1186/s12889-020-09302-3
- Sié, A., Tapsoba, C., Dah, C., Ouermi, L., Zabre, P., Bärnighausen, T., Arzika, A. M., Lebas, E., Snyder, B. M., & Moe, C. (2018). Dietary diversity and nutritional status among children in rural Burkina Faso. *International Health*, *10*(3), 157–162.
- Tebeje, D. B., Agitew, G., Mengistu, N. W., & Aychiluhm, S. B. (2022). Under-nutrition and its determinants among school-aged children in northwest Ethiopia. *Heliyon*, *8*(11).
- Thompson, A. L., Nicholas, K. M., Watson, E., Terán, E., & Bentley, M. E. (2020). Water, food, and the dual burden of disease in Galápagos, Ecuador. *American Journal of Human Biology*, *32*(1).
- UNICEF. (2022, December). *DIETS*. Unicef.Org. https://data.unicef.org/topic/nutrition/diets/
- United Nations Children's Fund (UNICEF), & World Health Organization. (2019). *Progress on household drinking water, sanitation and hygiene I 2000-2017*. https://washdata.org
- Vaivada, T., Akseer, N., Akseer, S., Somaskandan, A., Stefopulos, M., & Bhutta, Z. A. (2020). Stunting in childhood: an overview of global burden, trends, determinants, and drivers of decline. *The American Journal of Clinical Nutrition*, *112*(Supplement_2), 777S-791S.
- Weerasekara, P. C., Withanachchi, C. R., Ginigaddara, G. A. S., & Ploeger, A. (2020). Understanding Dietary Diversity, Dietary Practices and Changes in Food Patterns in Marginalised Societies in Sri Lanka. *Foods*, *9*(11). https://doi.org/10.3390/foods9111659

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