

Risk factors for undernutrition in children under five (6-59) months based on child and parents characteristics

Faktor risiko gizi kurang pada anak balita (6-59) bulan berdasarkan karakteristik anak dan orang tua

SAGO: Gizi dan Kesehatan
2024, Vol. 5(3) 693-701
© The Author(s) 2024



DOI: <http://dx.doi.org/10.30867/gikes.v5i3.1729>
<https://ejournal.poltekkesaceh.ac.id/index.php/gikes>



Poltekkes Kemenkes Aceh

Yuli Hartati^{1*}, Podojoyo², Nurul Salasa Nilawati³, Ahmad Sadiq⁴

Abstract

Background: Malnutrition in children under five is influenced by various factors, including child and parent factors. This is because of the different characteristics of each research site.

Objective: This study aimed to determine the risk factors for undernutrition in children under five years of age based on the characteristics of the child and parents.

Methods: This study used a cross-sectional design with a sample size of 149 children. The sampling was performed using simple random sampling. The research location was the working area of the Taman Bacaan Palembang Community Health Center from May to August 2023. Data were processed bivariately and multivariately using chi-square statistical tests and logistic regression with a confidence level of 95%.

Results: The results of the study showed that the risk factors based on child characteristics were birth weight ($p=0,013$, OR = 2,778), exclusive breastfeeding ($p=0,024$, OR= 2,216), complementary foods ($p=0,002$, OR= 2,993), infectious diseases ($p=0,000$, OR=10,440), colostrum administration ($p=0,004$, OR= 3,682), and immunization ($p=0,000$, OR= 4,475). Based on parental characteristics, the risk factors for undernutrition were father's education ($p=0,000$, OR= 3,907), mother's occupation ($p=0,000$, OR= 0,099), family income ($p=0,006$, OR= 3,560), and mother's nutritional knowledge ($p=0,000$, OR=8,971). The most dominant factors were maternal nutritional knowledge () and maternal education ($p=0,000$, OR= 20,079).

Conclusion: The risk factor for malnutrition in children was immunization ($p=0,000$, OR= 14,598) and the characteristics of parents were maternal education ($p=0,000$, OR= 20,079), with the dominant causal factor being maternal nutritional knowledge.

Keywords

Risk factors, Child characteristics, characteristics of parents, underweight

Abstrak

Latar Belakang: Gizi Kurang pada anak balita dipengaruhi oleh berbagai faktor, baik faktor dari anak itu sendiri maupun faktor dari orang tua. Hal ini terjadi karena perbedaan karakteristik pada masing-masing tempat penelitian.

Tujuan: Penelitian ini bertujuan untuk mengetahui faktor risiko gizi kurang pada anak balita berdasarkan karakteristik anak dan karakteristik orang tua.

Metode: Penelitian ini menggunakan desain cross-sectional dengan jumlah sampel sebanyak 149 anak. Pengambilan sampel dilakukan dengan cara simple random sampling. Lokasi penelitian di wilayah kerja Puskesmas Taman Bacaan Palembang pada bulan Mei sampai Agustus 2023. Data diolah secara bivariat dan multivariat dengan uji statistik Chi-square dan regresi logistik dengan Tingkat kepercayaan 95 %.

¹ Politeknik Kesehatan Kemenkes Palembang. Email : yuli.hartati@poltekkespalembang.ac.id

² Politeknik Kesehatan Kemenkes Palembang. Email : podojoyo@poltekkespalembang.ac.id

³ Politeknik Kesehatan Kemenkes Palembang. Email : nurulsalasa@poltekkespalembang.ac.id

⁴ Politeknik Kesehatan Kemenkes Palembang. Email : Ahmadsadiq@poltekkesPalembang.ac.id

Penulis Koresponding:

Yuli Hartati : Politeknik Kesehatan Kemenkes Palembang, Jln. Sukabangun I km 6,5 Palembang.
Email : yuli.hartati@poltekkespalembang.ac.id

Hasil: Hasil penelitian menunjukkan faktor risiko berdasarkan karakteristik anak adalah berat badan lahir ($p= 0,013$, $OR = 2,778$), pemberian ASI eksklusif ($p= 0,024$, $OR= 2,216$), makanan pendamping ASI ($p= 0,002$, $OR= 2,993$), penyakit infeksi ($p= 0,000$, $OR=10,440$), pemberian kolostrum ($p= 0,004$, $Or= 3, 682$), dan imunisasi ($p=0,000$, $OR= 4,475$). Berdasarkan karakteristik orang tua, faktor risiko gizi kurang adalah pendidikan ayah ($p= 0,000$, $OR= 3,907$), pekerjaan ibu ($p= 0,000$, $OR=0,099$), pendapatan keluarga ($p= 0,006$, $OR= 3,560$), dan pengetahuan gizi ibu ($p= 0,000$, $OR=8,971$). Faktor yang paling dominannya adalah pendidikan ibu ($p=0,000$, $OR= 20,079$).

Kesimpulan: Faktor risiko gizi kurang pada anak adalah imunisasi ($p= 0,000$, $OR= 14,598$) dan dari karakteristik orang tua adalah Pendidikan ibu ($p=0,000$, $OR= 20,079$), dengan faktor penyebab dominannya yaitu pengetahuan gizi ibu.

Kata Kunci

Faktor risiko, karakteristik anak, karakteristik orang tua, gizi kurang

Introduction

Undernutrition is still a problem in Indonesia. Kizi malnutrition cases nationwide amounted for 13,8%, South Sumatra for 12,31%, and Palembang for 12,36% (Kemenkes RI, 2020). In the 2019 RPJPM, the national target for undernutrition in children aged 0-59 months is 17%. Although national malnutrition cases are still below the target range, they must still be observed.

Therefore, it is necessary to analyze the factors that cause malnutrition. Many direct causes of malnutrition include lack of nutrient intake (Saunders & Smith, 2010) and infectious diseases. It is indirectly caused by knowledge of maternal nutrition, income, sanitation, and other factors (Saragih, 2010). Undernutrition in children under five years of age is caused by factors from the child itself such as nutrient intake (Govender et al., 2021a), infectious diseases, and sex (Abdulzahra et al., 2022; USAID, 2018). There are fewer nutritional risk factors than parental characteristics, such as parental education, maternal knowledge, socioeconomics, and occupation (Al Rahmad et al., 2020; Abdulzahra et al., 2022; Maidelwita, 2019).

Undernutrition affects children's intellectual abilities, which do not reach their maximum level (Howell et al., 2022; Suryawan et al., 2022). Children who experience malnutrition have impaired psychomotor development (Howell 2022). In addition, the possibility of stunting children is high (Howell et al., 2019); Kádár et al., 2022). Undernutrition is the leading cause of death in children under five years of age (Abdulzahra et al., 2022). Seeing the impact of undernutrition on children under five in the future of the nation and state must be a concern for all of us.

Puskesmas Taman Bacaan is located in Seberang Ulu II District, Palembang City, which is mostly on the banks of the Musi River and the head of the family, especially laborers. This study aimed to determine the risk factors of undernutrition based on the characteristics of children and parents. The hypothesis is that the characteristics of children and parents are risk factors for malnutrition in children under five age.

Methods

This Cross-sectional study was conducted between May and August 2023. The population in this study comprised children aged 6-59 months who were in the working area of the Taman Bacaan Public Health Center, Palembang. The study samples consisted of 149 children under five. Samples were taken by simple random sampling with the inclusion criterion of willingness to be sampled in a healthy state. The data were obtained through interviews and questionnaires. Before the study, the parents of the toddlers were asked to complete an informed consent form.

The data collected consisted of data on the characteristics of toddlers, including age, sex, history of exclusive breastfeeding, colostrum, immunization, infectious diseases, history of complementary foods, number of family members, and effectiveness in posyandu. In addition, the data on parental characteristics included education, occupation, income, and knowledge of maternal nutrition.

Anthropometric data were collected by direct measurement and weight data were obtained using a digital scale with an accuracy of 0.01 kg. Data other than anthropometry were obtained through interviews with the participants using questionnaires. All data collected for this study were analyzed using chi-square statistics and logistic regression analysis.

Result

Risk factors for undernutrition based on the characteristics of the child as risk factors for malnutrition in children under five years are shown in Table 1. In this study, a large sample of 149 people included 41,6% male and 58,4% female. the were 23,5% children had low birth weight. There were 44,3% children had infectious diseases in the past 1 month. the were 43,6% children were given complementary food for breast milk before the age of 6 months, and 79,2% children did not receive exclusive breastfeeding. A total of 18,1% children

were not given collustrum. At the time of the study, 25,5% of children had incomplete immunization, the number of family members was more than four, 21,5% of children and 13,4% of children did not comply with going to posyandu. Of the factors that were related as risk factors for undernutrition, birth weight ($p = 0,013$; $OR = 2,778$), infectious diseases ($p = 0,000$; $OR = 10,440$), exclusive breast milk ($p = 0,024$; $OR = 2,616$), complementary food for breast milk ($p = 0,002$; $OR = 2,993$), administration of colostrum ($p = 0,004$; $OR = 3,862$), and immunization ($p = 0,000$; $OR = 4,745$).

Table 1. Risk factors for undernutrition based on the characteristics of the child

Characteristic	Nutritional status				Total		P-V	OR	CI (95 %)		
	underweight		Normal		f	%			Lower	Upper	
	f	%	f	%							
Gender	boys	30	38,0	32	45,7	62	41,6	0,339	0,727	0,378	1,398
	Girls	49	62,0	38	54,3	87	58,4				
Birth Weight	low birth weight	25	31,6	10	14,3	35	23,5	0,013*	2,778	1,223	6,309
	No low birth weight	54	68,4	60	85,7	114	76,5				
Infectious Diseases	exist	54	68,4	12	17,1	66	44,3	0,000*	10,440	4,777	22,815
	None	25	31,6	58	82,9	83	55,7				
Complementary food for breast milk	≤ 6 month	44	55,7	21	30,0	65	43,6	0,002*	2,993	1,490	5,773
	> 6 month	35	44,3	49	70,0	84	56,4				
ASI Exlusive	No	57	72,2	61	87,1	118	79,2	0,024*	2,616	1,112	6,154
	Yes	22	27,8	9	12,9	31	20,8				
Provision of Colostrum	No	21	26,6	6	8,60	27	18,1	0,004*	3,862	1,458	10,233
	Yes	58	73,4	64	91,4	122	81,9				
Immunization	Incomplete	30	38,0	8	11,4	38	25,5	0,000*	4,745	1,997	11,272
	Complete	49	62,0	62	88,6	111	74,5				
Number of family members	> 4 persons	21	26,6	11	15,7	32	21,5	0,107	1,942	0,860	4,385
	≤ 4 persons	58	73,4	59	84,3	117	78,5				
Compliance to posyandu	Disobedient	13	16,5	7	10,0	20	13,4	0,249	1,773	0,664	4,731
	Obedient	66	83,5	63	90	129	86,6				

Table 2. Risk factors for undernutrition based on parental characteristics

Characteristic	Nutritional Status				Total		P-V	OR	CI (95 %)		
	Underweight		Normal		n	%			Lower	Upper	
	n	%	n	%							
Father's Education	Primary Education	53	67,1	24	34,3	77	51,7	0,000*	3,907	1,977	7,720
	Further Education	26	32,9	46	65,7	72	48,3				
Mother's Education	Primary Education	42	53,2	28	40	70	47,0	0,108	1,703	0,888	3,265
	Further Education	37	46,8	42	60	79	53,0				
Father's Work	Not a permanent worker	54	68,4	42	60,0	96	64,4	0,288	1,440	0,734	2,824
	Permanent workers	25	31,6	28	40	53	35,6				
Mother's work	Bekerja	49	62,0	66	94,3	115	72,2	0,000*	0,099	0,033	0,299
	Not Working	30	38,0	4	5,7	34	22,8				
Family Income	Low	72	91,1	52	74,3	124	83,2	0,006*	3,560	1,387	9,143
	high	7	8,9	18	25,7	25	16,8				
Maternal Nutrition Knowledge	Less	45	57,0	9	12,9	54	36,2	0,000*	8,971	3,913	20,563
	Good	34	43,0	61	87,1	95	63,8				

The characteristic parental factors associated with the incidence of malnutrition were paternal education ($p=0,000$; $OR=3,907$), mother's occupation ($p=0,000$; $OR=0,099$), family income ($p = 0,006$; $OR =$

$3,560$), and knowledge of maternal nutrition ($p = 0,000$; $OR = 8,971$). Maternal education, paternal employment, and family income were not associated with malnutrition incidence.

Table 3. Multivariate analysis model

Variable	p-value	OR
Model 1		
Infectious Diseases	0,075	3,051
Complementary food for breast milk	0,076	3,058
ASI Exlusive	0,041	5,684
Provision of Colostrum	0,181	2,876
Immunization	0,000	21,575
Father's education	0,003	7,768
Mother's work	0,000	0,029
Maternal Nutrition Knowledge	0,000	23,727
Model 2		
ASI Exlusive	0,025	6,023
immunization	0,000	18,822
Father's education	0,001	9,313
Mother's work	0,000	0,029
Maternal Nutrition Knowledge	0,000	22,548
Model 3		
Infectious Diseases	0,008	4,604
immunization	0,001	14,598
Father's education	0,001	7,638
Mother's education	0,000	20,079
Mother's work	0,000	0,41
ASI Exlusive	0,004	8,426

Table 4. Final multivariate analysis model

Variable	p-value	OR	95 % CI	Nagelkerke R Square
Final Modeling				0.704
Infectious Diseases	0,008	4,604	1,487 – 14,225	
Immunization	0,001	14,598	3,195 – 66,698	
Father's education	0,001	7,638	2,397 – 24,334	
Mother's education	0,000	20,079	5,304 – 76,008	
Mother's work	0,000	0,41	0,008 – 0,198	
ASI Exlusive	0,004	8,426	1,960 – 36,226	

In the final model, the variables associated with undernutrition were infectious diseases, immunization, paternal education, maternal education, maternal employment, and exclusive breastfeeding. Based on the Nagelkerke R-squared value = of 0,704, the independent variables contained in the model could explain the incidence of undernutrition by 70,4%. The most dominant variable for the incidence of undernutrition was maternal education, with a value of $OR = 20,079$ ($95\% CI = 5,304 – 76,008$), which means that mothers with a low level of education were at 20,1 times greater risk for their children to be undernourished than mothers with higher education.

Discussion

Undernutrition in children under five years of age has an impact not only on the present but also on the future of children and the country. Birth weight is one of the risk factors for undernutrition in children under five. Children born weighing less than 2500 g have a 1,76 times risk of malnutrition (Jana et al., 2023; Lukman et al., 2021; Aboagye et al., 2022). Birth weight is related to the nutritional status of the mother during and before pregnancy. A woman with nutritional status before pregnancy lacks chronic energy when pregnancy aggravates her condition. Pregnant

women with SEZ have been shown to have affected fetal growth. Nutritional status before pregnancy affects the availability of nutrients to support fetal growth. Exclusive breastfeeding is a risk factor for undernutrition in toddlers (Scherbaum and Srour 2016). These results are supported by previous studies showing that undernutrition is positively correlated with exclusive breastfeeding (Sahadewa et al., 2020; Sahadewa et al., 2016; Sahadewa et al., 2021).

Exclusive breastfeeding is the provision of breast milk only to infants from birth to six months of age old of age (UNICEF, 2018;Permatasari et al., 2018). Breast milk contains nutrients needed by babies, such as carbohydrates, fats, proteins, multivitamins, water, creatinine, and minerals, which are easily digested (Ahonen et al., 2013;Kim & Yi, 2020;Jama et al., 2020). Non-exclusive breastfeeding can endanger children's growth, development, and development and adversely affect the quality of human resources. Children who do not exclusively breastfeed have a lower nutritional intake and are at a risk of undernutrition.

The colostrum in infants is associated with malnutrition, stunting, and wasting (Liben et al. 2016). The results showed that children who were not given a collustrum were at risk 2 times for malnutrition (Kumar et al., 2006). Colostrum contains nutrients needed by newborns. Colostrum contains large amounts of lactoferrin, lactoperoxidase, and lysozyme, which have antimicrobial and antiviral properties (Silva et al. 2019). Human collustrum contains more lactoferrin and IgA than bovine collustrume26. The substances contained in collustrum increase the immunity of children so that they can avoid infectious diseases. Collostrum Colostrum can also meet the nutrients required by children at the beginning of their birth (Poonia & Shiva, 2022).

Complementary foods are foods or drinks provided to children aged 6–23 months to meet their nutritional needs (Sebayang et al. 2020). Suboptimal complementary feeding affects malnutrition in children of this age; therefore, the provision of decent, safe, nutritious, and adequate food should be prioritized during this period (Mekonnen et al., 2017). Starting at the age of six months, children begin to be introduced to complementary foods because, at this time, breast milk is not sufficient for their nutritional needs (Feng et al., 2022; Wang et al., 2018). Although

some studies state that there is no age relationship between complementary feeding, this should still be a concern because of the imperfection of the child's digestive tract (Pokharel et al., 2017).

Infectious diseases are also a risk factor for undernutrition in children under five years of age. Previous studies have shown that infectious diseases in children under five are associated with exclusive breastfeeding (Picauly, 2023). Infectious diseases are also associated with malnutrition (Govender et al. 2015; Govender et al. 2021b). Lack of nutrition is associated with decreased immunity in children. Malnourished children are susceptible to infectious diseases. In contrast, children who are often exposed to infectious diseases usually lack appetite, resulting in decreased body weight (Ratib et al., 2023). Infection is a complex mechanism with a global impact. The child's immunity begins during pregnancy. Pregnant women whose nutritional intake is good and who eat the fetus will develop well. This is related to fetal immunity to the disease after birth (Schaible & Kaufmann, 2007). Infectious diseases and malnutrition are interrelated. Infection is a predisposing factor for undernutrition that causes reduced intake and absorption of nutrients, which decreases immune function and increases the risk of infectious disease severity (Prendergast, 2015).

Previous research has shown a relationship between paternal education and a child's nutritional status. This is related to the father's work according to his education. Fathers with higher education levels had better jobs than those with lower education levels. This better job relates to earned income (Alderman & Headey, 2017);(Farooq et al., 2019);(Jana et al., 2023). The results of this study are similar to those of previous studies showing that paternal education is associated with the incidence of malnutrition.

The results of Anuja's research (2019) show that working mothers experience more malnourished children, both stunting, wasting, and underweight, than non-working mothers (V et al., 2019). There was a relationship between maternal occupation and the incidence of malnutrition ($P < 0,0001$) (V et al., 2019). Mothers who work outside their homes have little time to pay attention to their children's growth and development(Ahmed et al. 2022). The longer a mother works outside the home, the less time a mother spends caring for her child (Debela et al., 2021;Hosen et al., 2023;Salleh et al., 2023).

The results revealed a relationship between family income and the incidence of malnutrition. This is in line with other research that states that children from low-income families are more at risk of undernutrition than children from high-income high-income families with high incomes (Salleh et al., 2023). Families with low opinions found it more difficult to provide sufficient food for their families. Low-income families have low food security (Sumarmi et al., 2018). Relationship between maternal nutrition knowledge and malnutrition incidence This is in line with previous research that states that that maternal nutrition knowledge associated with gizzes gizzes is lacking in children under five (Sukandar et al., 2015). Mothers with good nutritional knowledge can manage children's diets well so that their growth and development will also be good (Prasticha Prasticha et al., 2015; Prasticha et al., 2023).

Conclusions

The risk factors for undernutrition based on child characteristics are birth weight, infectious diseases, complementary feeding, exclusive breastfeeding, colostrum feeding, and immunization. The risk factors for malnutrition based on parental characteristics are paternal education, maternal occupation, family income, and maternal nutritional knowledge. The dominant factor was the mother's education and nutritional knowledge.

Acknowledgment

We would like to thank the Health Polytechnic of the Ministry of Health Palembang for funding this research through the DIPA in 2023.

Conflict of Interest

The authors declare that they have no personal interests that may have impacted their work.

References

Abdulzahra, M. F., Ahmed, J. T., & Kadhem, Q. I. (2022). Prevalence of malnutrition among children under five years in Babylon Government, Iraq. *International Journal of*

- Health Sciences*, 6(May), 12885–12893. <https://doi.org/10.53730/ijhs.v6ns2.8394>
- Aboagye, R. G., Ahinkorah, B. O., Seidu, A. A., Frimpong, J. B., Archer, A. G., Adu, C., Hagan, J. E., Amu, H., & Yaya, S. (2022). Birth weight and nutritional status of children under five in sub-Saharan Africa. *PLoS ONE*, 17(6 June), 1–19. <https://doi.org/10.1371/journal.pone.0269279>
- Ahmed, M., Zepre, K., Lentero, K., Gebremariam, T., Jemal, Z., Wondimu, A., Bedewi, J., Melis, T., & Gebremeskel, A. (2022). The relationship between maternal employment and stunting among 6–59 months old children in Gurage Zone Southern Nation Nationality People's region, Ethiopia: A comparative cross-sectional study. *Frontiers in Nutrition*, 9(October), 1–11. <https://doi.org/10.3389/fnut.2022.964124>
- Ahonen, J., Rankinen, K., Holmberg, M., Syri, S., & Forsius, M. (2013). Human milk composition : nutrien and bioactive factors. *BPediatr Clin North Am*, 6(1), 49–74. <https://doi.org/10.1016/j.pcl.2012.10.002>
- Alderman, H., & Headey, D. D. (2017). How important is parental education for child nutrition? *World Development*, 94, 448–464. <https://doi.org/10.1016/j.worlddev.2017.02.007>
- Al Rahmad, A. H., Miko, A., Labatjo, R., Fajriansyah, F., Fitri, Y., & Suryana, S. (2020). Malnutrition prevalence among toddlers based on family characteristics: A cross-sectional study in the rural and urban areas of Aceh, Indonesia. *Sri Lanka Journal of Child Health*, 49(3), 263. <https://doi.org/10.4038/sljch.v49i3.9145>
- Debela, B. L., Gehrke, E., & Qaim, M. (2021). Links between maternal employment and child nutrition in Rural Tanzania. *American Journal of Agricultural Economics*, 103(3), 812–830. <https://doi.org/10.1111/ajae.12113>
- Farooq, M. U., Majeed Nadeem, A., & Ali, F. (2019). The impact of parents' education on child health from the perspective of demographic and health survey. *European Online Journal of Natural and Social Sciences*, 8(1), 158–174. <http://www.european-science.com>

- Feng, J., Gong, Z., Wang, Y., Huo, J., & Zhuo, Q. (2022). Complementary feeding and malnutrition among infants and young children aged 6–23 months in Rural Areas of China. *Nutrients*, *14*(9), 1–12. <https://doi.org/10.3390/nu14091807>
- Govender, I., Rangiah, S., Kaswa, R., & Nzaumvila, D. (2021a). Malnutrition in children under the age of 5 years in a primary health care setting. *South African Family Practice*, *63*(1). <https://doi.org/10.4102/safp.v63i1.5337>
- Govender, I., Rangiah, S., Kaswa, R., & Nzaumvila, D. (2021b). Malnutrition in children under the age of 5 years in a primary health care setting. *South African Family Practice*, *63*(1), 1–6. <https://doi.org/10.4102/SAFP.V63I1.5416>
- Hosen, M. Z., Pulok, M. H., & Hajizadeh, M. (2023). Effects of maternal employment on child malnutrition in South Asia: An instrumental variable approach. *Nutrition*, *105*, 111851. <https://doi.org/10.1016/j.nut.2022.111851>
- Jama, A., Gebreyesus, H., Wubayehu, T., Gebregyorgis, T., Teweldemedhin, M., Berhe, T., & Berhe, N. (2020). Exclusive breastfeeding for the first six months of life and its associated factors among children age 6-24 months in Burao district, Somaliland. *International Breastfeeding Journal*, *15*(1), 1–8. <https://doi.org/10.1186/s13006-020-0252-7>
- Jana, A., Dey, D., & Ghosh, R. (2023). Contribution of low birth weight to childhood undernutrition in India: evidence from the national family health survey 2019–2021. *BMC Public Health*, *23*(1), 1–14. <https://doi.org/10.1186/s12889-023-16160-2>
- Kádár, M., Szöllősi, G., Molnár, S., & Szabó, L. (2019). The incidence of malnutrition between 1 and 5 years of age on the basis of the preventive primary care data. *Developments in Health Sciences*, *2*(1), 9–14. <https://doi.org/10.1556/2066.2.2019.002>
- Kemenkes RI. (2020). Laporan Provinsi Sumatera Selatan Riskesdas RI 2018. In *Lembaga Penerbit Badan Penelitian dan Pengembangan Kesehatan* (Vol. 19, Issue 9). <http://ejournal2.litbang.kemkes.go.id/index.php/lpb/article/view/3665>
- Kim, S. Y., & Yi, D. Y. (2020). Components of human breast milk: From macronutrient to microbiome and microRNA. *Clinical and Experimental Pediatrics*, *63*(8), 301–309. <https://doi.org/10.3345/cep.2020.00059>
- Kumar, D., Goel, N. K., Mittal, P. C., & Misra, P. (2006). Influence of infant-feeding practices on nutritional status of under-five children. *Indian Journal of Pediatrics*, *73*(5), 417–421. <https://doi.org/10.1007/BF02758565>
- Legesse Liben, M., Abuhay, T., & Haile, Y. (2016). The Role of colostrum feeding on the nutritional status of preschool children in Afambo District, Northeast Ethiopia: Descriptive Cross Sectional Study. *European Journal of Clinical and Biomedical Sciences*, *2*(6), 87. <https://doi.org/10.11648/j.ejcb.20160206.15>
- Lukman, T. N. E., Anwar, F., Riyadi, H., Harjomidjojo, H., & Martianto, D. (2021). Birth weight and length associated with stunting among children under-five in Indonesia. *J. Gizi Pangan*, *16*(1), 99–108.
- Maidelwita, Y. (2019). Risk factors for malnutrition of children under five years old on the area of Nanggalo Public. *Malaysian Journal of Medical Research*, *3* (January), 10–17. <https://doi.org/10.31674/mjmr>.
- Mekonnen, T. C., Workie, S. B., Yimer, T. M., & Mersha, W. F. (2017). Meal frequency and dietary diversity feeding practices among children 6-23 months of age in Wolaita Sodo town, Southern Ethiopia. *Journal of Health, Population, and Nutrition*, *36*(1), 18. <https://doi.org/10.1186/s41043-017-0097-x>
- Nurhasanah, P. C., Herawati, D. M. D., & Resnaldi. (2015). Nutritional status and infectious disease of undernourished children under five in Cipacing Regency, Jatiningor Subdistrict, West Java, from April to December 2012. *Althea Medical Journal*, *2*(3), 339–345. <https://doi.org/10.15850/amj.v2n3.553>
- Permatasari, T. A. E., Sartika, R. A. D., Achadi, E. L., Purwono, U., Irawati, A., Ocviyanti, D., & Martha, E. (2018). Exclusive breastfeeding intention among pregnant women. *Kesmas*, *12*(3), 134–141. <https://doi.org/10.21109/kesmas.v12i3.1446>
- Picauly, I. (2023). Relationships between exclusive breastfeeding, and history of illness, and

- stunting in children under five. *Journal of Maternal and Child Health*, 8(1), 116–124. <https://doi.org/10.26911/thejmch.2023.08.01.11>
- Pokharel, P., Adhikari, A., Lamsal, P., & Adhikari, R. (2017). Effect of complementary feeding practices and nutritional status of children (6-23 months) in Tamang Community, Ambhanjyang VDC of Makwanpur. *Janaki Medical College Journal of Medical Science*, 5(1), 22–32. <https://doi.org/10.3126/jmcjms.v5i1.17984>
- Poonia, A., & Shiva. (2022). Bioactive compounds, nutritional profile and health benefits of colostrum: a review. *Food Production, Processing and Nutrition*, 4(1). <https://doi.org/10.1186/s43014-022-00104-1>
- Prasticha, A. D., Sampurna, M. T. A., & Dewanti, L. (2023). Correlations between maternal knowledge, attitude, and posyandu utilization on nutritional status in children under five. *Journal of Maternal and Child Health*, 8(2), 188–202. <https://doi.org/10.26911/thejmch.2023.08.02.06>
- Prendergast, A. J. (2015). Malnutrition and vaccination in developing countries. *Philosophical Transactions of the Royal Society B: Biological Sciences*, 370(1671). <https://doi.org/10.1098/rstb.2014.0141>
- Ramos Howell, A. A. (2022). “Effects of malnutrition on the psychomotor development of children.” *Biomedical Journal of Scientific & Technical Research*, 44(2), 35435–35438. <https://doi.org/10.26717/bjstr.2022.44.007038>
- Ramos Howell, A. A., Montejo, J. L. B., Navarro, A. M. P., Celins, L. J. P., Torres, L. V. M., Paredes, D. L. R., Escobar, E. P. R., & Silvera, Z. M. S. (2022). Effects of nutrition on development. *Health Science Journal*, 16(S7:954), 1–3. <https://doi.org/10.36648/1791-809X.16.S7.954>
- Ratib, D., Chakrabartty, A., & Kahuma Kabakyenga, diversity, and consumption of animal source foods among Indonesian children. *Maternal and Child Nutrition*, 16(1), 1–19. <https://doi.org/10.1111/mcn.12889>
- Setiawan, M. I., Husaini, Yulidasari, F., Angraini, L., J. (2023). Persistent malnutrition among children under five in Pastoral Communities of Aweil Centre, South Sudan. *International Journal of Scientific Research and Management*, 11(03), 4682–4697. <https://doi.org/10.18535/ijstrm/v11i03.nd1>
- Sahadewa, S., Salindri, N., Miladyna, S., & Hadijah, S. (2021). The corelation of exclusive breastfeeding with nutritional status in babies age 6-24 months at the Kedungsari Health Center, Mojokerto Regency. *Jurnal Ilmiah Kedokteran Wijaya Kusuma*, 10(2), 261. <https://doi.org/10.30742/jikw.v10i2.1608>
- Salleh, R., Ahmad, M. H., Man, C. S., Wong, N. I., Sallehuddin, S. M., Palaniveloo, L., Che Abdul Rahim, N. S., Baharudin, A., Saad, H. A., Omar, M. A., & Ahmad, N. A. (2023). Risk Factors Associated with Underweight Children Under the Age of Five in Putrajaya, Malaysia: A Case-Control Study. *Jurnal Gizi Dan Pangan*, 18(2), 89–98. <https://doi.org/10.25182/jgp.2023.18.2.89-98>
- Saragih, B. (2010). Analisis kebijakan penanganan masalah gizi di kalimantan timur berdasarkan pengalaman berbagai negara. *Jurnal Borneo Administrator*, 6(3), 1–20.
- Saunders, J., & Smith, T. (2010). Malnutrition: causes and consequences. *Clinical Medicine, Journal of the Royal College of Physicians of London*, 10(6), 624–627. <https://doi.org/10.7861/clinmedicine.10-6-624>
- Schaible, U. E., & Kaufmann, S. H. E. (2007). Malnutrition and infection: Complex mechanisms and global impacts. *PLoS Medicine*, 4(5), 0806–0812. <https://doi.org/10.1371/journal.pmed.0040115>
- Scherbaum, V., & Srouf, M. L. (2016). The role of breastfeeding in the prevention of childhood malnutrition. *World Review of Nutrition and Dietetics*, 115(August), 82–97. <https://doi.org/10.1159/000442075>
- Sebayang, S. K., Dibley, M. J., Astutik, E., Efendi, F., Kelly, P. J., & Li, M. (2020). Determinants of age-appropriate breastfeeding, dietary Putri, A. O., Laily, N., Noor, M. S., Rahman, F., Anhar, V. Y., Wulandari, A., Sari, A. R., & Rosadi, D. (2020). Exclusive breastfeeding for preventing the occurrence of wasting among under-five children in Guntung

- Payung, Banjarbaru. *Malaysian Journal of Medicine and Health Sciences*, 16, 25–26.
- Silva, E. G. D. S. O., Rangel, A. H. D. N., Mürmam, L., Bezerra, M. F., & de OLIVEIRA, J. P. F. (2019). Bovine colostrum: Benefits of its use in human food. *Food Science and Technology (Brazil)*, 39, 355–362. <https://doi.org/10.1590/fst.14619>
- Sukandar, D., Khomsan, A., Anwar, F., Riyadi, H., & Mudjajanto, E. S. (2015). Nutrition knowledge, attitude, and practice of mothers and children nutritional status improved after five months nutrition education intervention. *International Journal of Sciences: Basic and Applied Research (IJSBAR) International Journal of Sciences: Basic and Applied Research*, 23(2), 424–442. <http://gssrr.org/index.php?journal=JournalOfBasicAndApplied>
- Sumarmi, S., Mahmudiono, T., & Melaniani, S. (2018). Household food insecurity and undernutrition in children below 5 years living in different geographical areas in East Java, Indonesia. *Malaysian Journal of Nutrition*, 24(4), 529–538.
- Suryawan, A., Jalaludin, M. Y., Poh, B. K., Sanusi, R., Tan, V. M. H., Geurts, J. M., & Muhandi, L. (2022). Malnutrition in early life and its neurodevelopmental and cognitive consequences: a scoping review. *Nutrition Research Reviews*, 35(1), 136–149. <https://doi.org/10.1017/S0954422421000159>
- UNICEF. (2018). Breastfeeding: A mother’s gift, for every child - UNICEF DATA. *Unicef*, 1–13. <https://data.unicef.org/resources/breastfeeding-a-mothers-gift-for-every-child/>
- USAID. (2018). *Malnutrition causal factors in under-5 children in senegal phase i : Desk review report in under-5 children in Senegal* (Issue December).
- V, A., A, S., Doss, S., & J, T. (2019). The effect of maternal employment on the nutritional status of pre-school children. *National Journal of Physiology, Pharmacy and Pharmacology*, 9(12), 1. <https://doi.org/10.5455/njppp.2019.9.0828910092019>
- Wang, Y., Zhou, H., Zhang, Y., Huang, X., Yang, Y., Liu, X., Yang, C., & Wang, A. (2018). Double burden of malnutrition among children under 5 in poor areas of China. *PLoS ONE*, 13(9), 1–12.