



# Adequacy of Essential Amino Acids for Vegetarian Children in “The Dayak Hindu Budha Bumi Segandhu Tribe Community” in Indramayu

*Alvina Fadila Maulida\*, Ai Nurhayati, Rita Patriasih*

Program Studi Pendidikan Tata Boga, Universitas Pendidikan Indonesia, Bandung, Indonesia

Correspondence: E-mail: [alvinamaulida98@gmail.com](mailto:alvinamaulida98@gmail.com)

## ABSTRACTS

Vegetarian children in the fulfillment of animal protein intake are generally included in the low category. Animal protein is a good source of essential amino acids. The purpose of this study was to obtain information regarding the level of adequacy of essential amino acids for vegetarian children. The method with quantitative descriptive analysis, the sample used by the census technique was taken from all vegetarian children in the research location totaling 8 respondents. The results showed that the limiting amino acid lysine was taken from rice as a staple food and bakwan as a snack. The limiting amino acid tryptophan is extracted from eggs as animal protein. The limiting amino acids methionine and cystine are taken from tofu and tempeh as vegetable protein, mushrooms as vegetables, and bananas as fruit. The level of protein adequacy of respondents was 72.63% in the moderate deficit category. The level of adequacy of the amino acid lysine as a limiter was 84.16% in the mild deficit category, tryptophan 96.56% in the sufficient category, threonine 120% in the sufficient category, methionine and cystine in the excess category 129.13%. Researchers recommend respondents to increase their consumption of foods high in the amino acid lysine, for example eggs according to the Nutritional Adequacy Rate.

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## 1. INTRODUCTION

Children are the age of an individual in the womb until the age of 18 years (Ministry of Health. 2019). WHO (2020) children are residents of a country who are still in the womb until they are 19 years old. Children are a vulnerable group in the problem of malnutrition, which is closely related to the human life cycle (Zuridah Nasution. 2017). Children are a group that is in the process of growth and development. Arisman (2007) intake of protein nutrients is needed by children because it functions as a regulator and builder for the body.

In Krimun Village, Indramayu, there is a community of "Dayak Hindu Buddhist Bumi Segandhu Tribe" who believe in a vegan diet as well as children, following the lacto ovo vegetarian diet (Eniwati, et al. 2019). They do not eat meat, fish and poultry, even though this type of food is a source of animal protein. Animal protein includes complete and high-quality nutrients, with an almost perfect composition of essential amino acids and is indispensable for growth, especially in children.

There are five kinds of essential amino acids that are prone to deficiency in humans including; lysine, threonine, tryptophan, methionine and cystine (Hardinsyah and Drajat Martianto. 1988). The way to meet the needs of essential amino acids is obtained from food consumption, according to Hardinsyah (1988) food consumption is the amount of diverse or single food eaten by a person or group with a specific purpose, influenced by various things including religion and culture.

The essential amino acids contained in plant foods are not as complete as those of animals and are generally limited to a few amino acids (Ai Nurhayati, 1990). There are plant proteins that contain a lot of lysine but contain little valine, therefore a combination of foods is needed to meet the needs of essential amino acids for the body. Research Rahmi, et al. (2015) at the Metta Maitreya elementary school, the adequacy of protein intake of subjects with adequacy status of protein intake of 90% lacto ovo vegetarian children experienced more intake. This is due to respondents consuming a variety of foodstuffs, vegetables and nuts and their processed products such as tofu and tempeh, eggs and milk and their processed products. In contrast to the results of research at the Bhaktivedanta Dharma elementary school, the protein intake of the vegetarian group was 63.4 grams while the non-vegetarian group showed a figure of 83.6 grams (Purwaningsih, et al. 2019).

Based on the explanation above, the researcher wanted to know the level of essential amino acid intake of lacto ovo vegetarian children in the "Dayak Hindu Buddhist Bumi Segandhu Tribe" in Indramayu.

## 2. METHODS

This research is a quantitative descriptive study, carried out in Krimun Village, Losarang District, Indramayu Regency starting from January-July 2020. The study uses a census technique, where all children of the community are "Dayak Hindu Buddha Bumi Segandhu Tribe".

A total of 8 respondents, data were taken using food recall 2x24 hours. Nutritional analysis of foodstuffs, calculated using the conversion of the List of Foodstuffs Groups (DKBM) and the List of Essential Amino Acids (DKAE). Adequacy of essential amino acids was analyzed by calculating the amino acid score. The results of the analysis are categorized as follows:

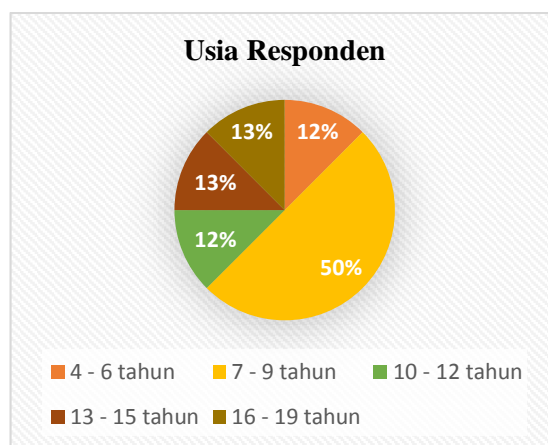
>70% AKG	= High Deficit
70% - 79% AKG	= Midle Deficit
80% - 89% AKG	= Low Deficit
90% - 119% AKG	= Sufficiently
≥120% AKG	= Excess

### 3. RESULTS AND DISCUSSION

The results of the research on the characteristics of the respondents, the type of food consumed by lacto-ovo vegetarian children along with the highest and limiting amino acid content, the level of protein intake adequacy and the level of adequacy of amino acid intake and the amino acid score are described as follows:

#### 3.1. Characteristics of Respondents

Respondents are children of “Dayak Hindu Buddha Bumi Segandhu” in Indramayu who follow the lacto ovo pattern. Adequacy of nutrition in children, differentiated based on age grouping, namely; 4-6 years, 7-9 years, 10-13 years, 15-18 years which refers to the RDA. Characteristics of respondents from the age of the child can be seen in Figure 1.



**Figure 1.** Characteristics of Respondents

Figure 1 shows the total number of respondents collected by 8 people based on age, divided into five groups, namely 4-6 years (12.5%) 1 respondent, 7-9 years (50%) 4 respondents, 10-12 years (12.5%) 1 respondent, 13-15 years (12.5%) 1 respondent, 16-18 years (12.5%) 1 respondent. Gender consisted of 7 respondents (87.5%) female and 1 respondent (12.5%) male.

#### 3.2. Lacto Ovo Vegetarian Child Food Consumption

The results of tracing food consumption in respondents using food recall 2x24 hours can be seen in Table 1 in the following table:

**Table 1.** Types of Foodstuffs

Highest amino acid	Food material	Limiting amino acids	Food material
Leucine	Rice, potato, corn	Lysine	Rice, noodles, vermicelli, corn Bakwan, crackers
Methionine and Cystine	Noodles, vermicelli Crackers, bakwan	Methionine and Cystine	Potato Tahu and tempe Peanuts Long beans, mustard greens, kale, spinach, mushrooms Fried bananas, risoles, cilor/cilok
Treronine	Carrots, kale Bananas, oranges, papayas.	Tryptophan	Eggs, carrots, cucumbers, bananas, oranges, papayas
Tyrosine	Peanuts		
Lysine	Eggs, tahu, tempe, mushrooms, bean sprouts, long beans, cucumber, mustard greens, spinach, fried bananas, risoles, cilor/cilok		

Based on Table 1, the types of food consumed with the highest amino acid leucine are; rice, potato and corn, there is a limiting amino acid lysine with the type of food, namely; rice, noodles, vermicelli, corn, bakwan and crackers. Types of foods that are high in the amino acids methionine and cystine are; noodles, vermicelli, crackers and bakwan, there are limiting amino acids methionine and cystine with the type of food, namely; potatoes, peanuts, tofu, tempeh, long beans, mustard greens, kale, spinach, mushrooms, fried bananas, risoles, cilok. Types of foods with amino acids that are high in lysine, namely; eggs, tofu, tempeh, mushrooms, bean sprouts, long beans, cucumbers, mustard greens, fried bananas, risoles, and cilok, the limiting amino acid is tryptophan with the type of food, namely; eggs, carrots, cucumbers, bananas, oranges and papayas. Types of foods high in tyrosine are peanuts, while those high in threonine such as foodstuffs; carrots, kale, bananas, oranges, and papayas.

Food ingredients that lack amino acid content can be supplemented by combining more than one type of food material, so that amino acid deficiencies are covered (Winarno. 1991). The combination of food ingredients is intended to increase the protein quality of foodstuffs and can complement the needs of essential amino acids so that no shortage (Hardinsyah and Drajat Martianto. 1988). J. Lean Michael (2013) To assess the quality of dietary protein, it can be seen from the number of essential amino acids obtained from the List of Essential Amino Acid Compositions (DKAE) in each type of food ingredient.

The food ingredients consumed by the "Dayak Hindu Buddha Bumi Segandhu Tribe" are in line with the research of Sukandar and Eddy S Mudjajanto (2009) regarding the type of food consumed by the Baduy Banten tribe, but there are differences in the types of animal protein, vegetables and snacks. The food ingredients of the Baduy tribe consist of staple food, animal and vegetable side dishes, vegetables, fruit and snacks (bakwan). The staple food consumed by the "Dayak Hindu Buddha Bumi Segandhu" is rice with the limiting amino acid lysine, in line with research by Imas Siti, et al. (2017) that the majority of the people of Indramayu make a living as farmers, with rice as the main commodity. In contrast to the results of research by Ellis Endang, et al (2016) regarding the staple food consumed by the people of the Cireundeu Traditional Village, namely cassava rice / constellations. In addition to staple foods, there is an animal side dish that is consumed, namely eggs with the limiting amino acid threonine. Vegetable protein is tempeh and tofu with limiting amino acids are methionine and cystine.

The vegetables he consumes are cassava leaves with the limiting amino acid threonine. Bananas with the limiting amino acid tryptophan. Lysine as the limiting amino acid for bakwan snacks which are salty snacks. The type of food consumed outside the main meal time can be called a snack (Ai Nurhayati, 2012). In line with research by Piernas and Popkin (2010) that snack consumption in children is in the form of sweet cakes, soft drinks, salty snacks, dairy products, vegetables and fruits.

### 3.3. Adequate Level of Protein Intake

The amount of food can be categorized based on nutrients. Sulistyoningsih (2011). In this study focused on the amount of protein intake which is the source in determining the intake of essential amino acids. The recommended protein intake refers to the lacto ovo vegetarian diet guidelines, which can be seen in Table 2.

**Table 2.** Total Protein Intake

Age (year)	f	max	min	Intake (mg)	Recommended (mg)	SL (%)	Note
4-6	1	38	21	28.4	36.2	78.47	Midle Deficit
7-9	4	33	15	22.7	40.6	55.97	High Deficit
Female							
10-12	1	23	22	22.5	40.6	55.36	High Deficit
13-15	1	40	37	38.5	43.3	88.83	Low Deficit
16-18	1	37	33	35.0	41.2	84.97	Low Deficit
<b>Sum</b>	<b>8</b>						
<b>Mean</b>		34	26	29.4	40.4	72.63	Midle Deficit

\*SL: Sufficiency Level

Protein intake is very important for the process of growing and developing children. The results of the study on the level of protein adequacy are in Table 2, categorized based on the age of the respondents. In the group of 4-6 years, 78.47% including the category of moderate deficit, 7-9 years of 55.97% including the category of severe deficit, 10-12 years of 55.63% including the category of severe deficit, 13-15 years of 88.83% including the mild deficit and 16 -18 years of 84.97% is included in the category of mild deficit. One of the reasons for the lack of protein intake is the insufficiency of recommended servings of meals a day which results in a lack of calorie intake so that protein replaces the function of carbohydrates as energy (calories). The average level of protein intake adequacy for all respondents is 72.63% including the category of moderate deficit.

### 3.4. Adequacy Level of Essential Amino Acids

Adequacy of essential amino acids that can be obtained from the intake of foods containing protein, a good source is vegetable and animal protein. The results of research regarding the level of adequacy of essential amino acids can be seen in Table 3.

**Table 3.** Levels of Sufficiency of Essential Amino Acids

Essential Amino Acids	Average consumption (mg)	Recommended (mg)	*SL (%)	Note
Lysine	40.68	48	84.16	Low Deficit
Threonine	24.14	25	96.56	Fair
Tryptophan	7.92	6.6	120	Fair
Methionine and Cystine	29.7	23	129.13	Excess

\*SL: Sufficiency Level

FAO (2013) the need for lysine amino acid intake that needs to be met is 48 mg while the results of the study in Table 3 show that the amino acid lysine is the lowest percentage at 84.16% including a mild deficit which indicates a limiting amino acid. This is in line with the results of Hardinsyah's (1988) research on amino acid scores in various rural and urban areas in Indonesia, using theoretical calculations with population food consumption data from the National Socio-Economic Survey (SUSENAS). The calculation uses the pattern of adequacy of essential amino acids in children under five which results in food consumption in all regions of Indonesia having the essential amino acid lysine as the limiting amino acid or amino acid score.

Essential amino acids are sourced from protein, if the body lacks essential amino acids it will have an impact on lack of protein intake as well which can cause wasting in the future. In line with the research of Hena Ferlina, et al (2020) in Mandalasari Village, Garut Regency, protein intake is still lacking with the amount of protein intake in children with wasting cases an average of 29.6 grams / day from the recommended RDA of 35 grams, the parameters for the level of nutritional intake are < 70% of the RDA because the energy consumption level is only 60.16% including the deficit category. The results of research by Renata Risky, et al (2020) regarding the quality of the diet of the Harapan Bangsa Cimahi Creative Elementary School students based on the healthy eating index of elementary school children still do not meet the rules of balanced nutrition as much as > 88% still need improvement to meet balanced nutrition, one of which is protein intake. . The results of the research by Francois Mariotti and Crishtopher (2019) Insufficient protein intake from a vegetarian diet can occur if the diet does not consume high-protein foods such as animals and nuts.

#### 4. CONCLUSION

Staple food, animal side dishes, vegetable side dishes, vegetables, fruit and snacks. The staple food that is often consumed is rice with the limiting amino acid lysine. Animal side dishes consumed are eggs with the limiting amino acid tryptophan. Vegetable side dishes consumed are tempeh and tofu whose limiting amino acids are methionine and cystine. Vegetables consumed are mushrooms with the limiting amino acids methionine and cystine. The fruit consumed is bananas whose limiting essential amino acids are methionine and cystine. the snack consumed is bakwan whose limiting amino acid is lysine. The level of protein intake of lacto ovo vegetarian children was divided into three, namely: mild, moderate and severe deficits. The average level of protein intake of respondents is 72.63% including the category of moderate deficit. The adequacy level of the amino acid lysine was 84.16% in the mild deficit category, tryptophan by 96.56% in the sufficient category, threonine by 120% in the sufficient category, methionine and cystine by 129.13% in the excess category. The amino acid score is

the limiting essential amino acid that can be absorbed by the body. The lowest level of adequacy of essential amino acids was 84.16%, namely the amino acid lysine. A total of 84.16 mg of the amino acid lysine that can be optimally absorbed and used by respondents.

## 6. REFERENCES

- Ai Nurhayati (1990) Suplementasi bahan makanan sumber protein nabati dalam variasi hidangan untuk menu seimbang bagi vegetarian. (Tugas Akhir). Fakultas Pendidikan Teknologi dan Kejuruan. Institut Keguruan dan Ilmu Pendidikan. Bandung.
- Ai Nurhayati, dkk. (2012). Pengaruh Mata Kuliah Berbasis Gizi Pada Pemilihan Makanan Jajanan Mahasiswa Program Studi Pendidikan Tata Boga. Bandung; Jurnal Penelitian Pendidikan. Vol.13, No.1, April 2012. [Online] Diakses dari: <http://jurnal.upi.edu/file/1-ai-pdf>
- Arisman, 2007. Gizi Dalam Daur Kehidupan. Jakarta : Penerbit Buku Kedokteran.
- Ellis Endang, dkk. (2016). Learning from Cireundeu: a prototype of local wisdom-based cultural traditional village and food security. International Conference on Innovation in Engineering and Vocational Education (ICIEVE). Atlantis Press. [Online] Diakses dari: <https://scholar.google.com/scholar?oi=bibs&cluster=12750161013185592324&btnI=1&hl=id>
- Eniwati, dkk (2019). Hubungan asupan protein nabati dengan kadar hemoglobin pada wanita usia remaja vegan Lampung: Medula Vol.9, No.1 Juli 2019. [Online]. Diakses dari <http://juke.kedokteran.unila.ac.id/index.php/medula/article/viewFile/2374/pdf>.
- FAO. (2017). Protein quality assessment in follow-up formula for young children and ready to use therapeutic foods. Report of the FAO expert working group. Rome. [Online]. Diakses dari <http://www.fao.org/3/CA2487EN/ca2487en.pdf>
- Francois Mariotti and Christopher (2019). Dietary Protein and Amino Acids in Vegetarian Diets-A Review. Journal Nutrients, 11,266; doi:10.3390/nu11112661. [Online]. Diakses dari: <https://www.mdpi.com/2072-6643/11/11/2661>
- Hardinsyah & Martianto (1988). Menaksir Kecukupan Energi dan Protein serta penilaian mutu gizi konsumsi pangan. Wirasari: Jakarta.
- Hena Ferlina, dkk (2020). Asupan Energi Pada Anak Wasting Di Desa Mandalasari Kabupaten Garut. Bandung: Jurnal Media Pendidikan, Gizi dan Kuliner. Vol.9 No 1 April 2020. [Online]. Diakses dari <https://ejournal.upi.edu/index.php/Boga/article/view/23914>.
- Imas Siti, dkk (2017). Pengembangan Kapasitas Masyarakat Dalam Menggunakan Hanjeli Sebagai Alternatif Pengganti Beras Sebagai Pangan Pokok dan Produk Olahan. Jurnal Penelitian & PKM. Vol.4, No.2, hlm 129-389.[Online] Diakses dari: <http://jurnal.unpad.ac.id/prosiding/article/download/14230/6889>
- J. Lean Michael (2013). Ilmu Pangan ,Gizi & Kesehatan. Pustaka Pelajar: Yogyakarta.
- Menteri Kesehatan Republik Indonesia. (2019). Peraturan Menteri Kesehatan Republik Indonesia Nomor 28 tentang Angka Kecukupan Gizi yang dianjurkan untuk Masyarakat Indonesia. [Online]. Diakses dari

[http://hukor.kemkes.go.id/uploads/produk\\_hukum/PMK\\_No\\_\\_28\\_Th\\_2019\\_ttg\\_Angka\\_Kecukupan\\_Gizi\\_Yang\\_Dianjurkan\\_Untuk\\_Masyarakat\\_Indonesia.pdf](http://hukor.kemkes.go.id/uploads/produk_hukum/PMK_No__28_Th_2019_ttg_Angka_Kecukupan_Gizi_Yang_Dianjurkan_Untuk_Masyarakat_Indonesia.pdf)

Piernas C, Popkin B (2010). Trends in snacking among United State children. Health affairs. No.29. pg.398-404. [Online]. Diakses dari: <https://www.healthaffairs.org/doi/pdf/10.1377/hlthaff.2009.0666>

Purwaningsih, dkk (2019). Asupan zat gizi dan status gizi anak vegetarian dan non vegetarian kelas 3-6 Sekolah Dasar Bhaktivedanta Dharma School. Bali: Jurnal medika Vol.8, No.1 Januari 2019. [Online]. Diakses dari <https://ojs.unud.ac.id/index.php/eum/article/view/MU.2019.v8.i1.P4>

Rahmi Rafika, dkk (2015).Kecukupan Asupan Protein dan Asupan Vitamin B12 pada anak vegetarian di sekolah dasar Metta Maitreya. Pekanbaru: JOM FK Vol.2, No.2 Oktober 2015. [Online]. Diakses dari <https://jom.unri.ac.id/index.php/JOMFDOK/article/view/6205>

Renata Risky, dkk (2020). Analisis Kualitas Diet Siswa Sekolah Dasar Kreatif Harapan Bangsa Cimahi: Jurnal Media Pendidikan, Gizi dan Kuliner. Vol.9 No 1 April 2020. [Online]. Diakses dari <https://ejournal.upi.edu/index.php/Boga/article/view/24937> .

Sulistyoningsih, Hariyani (2011). Gizi Untuk Kesehatan Ibu dan Anak.Yogyakarta: Graha Ilmu.

Sukandar & Eddy S Mudjajanto (2009). Kebiasaan dan Konsumsi Pangan Suku Baduy. Bogor: Jurnal Gizi dan Pangan Vol 4 No 2 Juli 2009. [Online]. Diakses dari [https://www.researchgate.net/publication/279433729\\_KEBIASAAN\\_DAN\\_KONSUMSI\\_PANGAN\\_SUKU\\_BADUY](https://www.researchgate.net/publication/279433729_KEBIASAAN_DAN_KONSUMSI_PANGAN_SUKU_BADUY).

Winarno, F.G. (1991). Kimia Pangan dan Gizi. PT Gramedia;Jakarta.

WHO (2020). Pembagian Kelompok Umur Anak. [Online]. Diakses dari: [https://www.sehatq.com/artikel/risiko-penyakit-berdasarkan-klasifikasi-umur-menurut-who\(2020\)](https://www.sehatq.com/artikel/risiko-penyakit-berdasarkan-klasifikasi-umur-menurut-who(2020))

Zuridah Nasution (2017). Materi kuliah STIKES HELVETIA. Kelompok rentan masalah gizi di masyarakat. [Online]. Diakses dari <https://slideplayer.info/slide/11907882/>