

## Effect of Giving Snakehead Fish Extract (*Channa striata*) on Albumin Levels, Neutrophil, and Lymphocyte in Hypoalbuminemia Patients

Ailsa Amelia Khoirunnisa<sup>1)</sup>, Annasari Mustafa<sup>2)</sup>, Nur Rahman<sup>3)</sup>

*Undergraduate Program in Applied Nutrition and Dietetics, Department of Nutrition  
Health Polytechnic of the Ministry of Health Malang  
Dietitian Professional Education Study Program, Department of Nutrition  
Health Polytechnic of the Ministry of Health Malang  
Correspondence: Annasari Mustafa: annasary@yahoo.com*

### Abstract

**Background:** Hypoalbuminemia is a condition where the albumin level in the blood drops below normal. Hypoalbuminemia is known as a marker of protein energy malnutrition, inflammation, infection, liver disease, kidney disease and postoperative stress. In Indonesia, hospital malnutrition data shows 40-50% of patients have hypoalbuminemia or are at risk of hypoalbuminemia, 12% of them are severe hypoalbuminemia, and the hospitalization period for malnourished patients in hospital shows 90% longer than patients with good nutrition. Neutrophils and lymphocytes are increased when inflammation occurs. Oral administration of high nutrition with snakehead fish (*Channa striata*) extract is an alternative treatment for hypoalbuminemia. **Purpose :** The purpose of this study was to determine the effect of snakehead fish extract (*Channa striata*) on albumin, neutrophil, and lymphocyte levels in patients with hypoalbuminemia. **Methods :** Articles were compiled using a systematic literature review method, involving national and international journals by taking journals through Google scholar, Pubmed, Research Gate, Scient direct. **Results :** There was an effect of giving snakehead fish extract on albumin levels, neutrophil values, and lymphocyte values in hypoalbuminemic patients and experimental animals. **Conclusion:** The content of amino acids, albumin, Zn, Fe, Cu and unsaturated fatty acids in snakehead fish (*Ophiocephalus striatus*) is quite effective as an effort to increase albumin levels, reduce neutrophil and lymphocyte values when inflammation occurs in hypoalbuminemic patients .

**Keywords:** *Channa striata* extract, Albumin, Neutrophils, Lymphocytes, Hypoalbuminemia

### INTRODUCTION

Hypoalbuminemia is a condition in which the albumin level in the blood falls below normal. Hypoalbuminemia is known as a marker of protein energy malnutrition, inflammation, infection, liver disease, kidney disease and postoperative stress (Levitt , D , 2016). Akirov's research, A (2017) showed that hypoalbuminemia was found in 19.8% of patients with nervous system disorders, 14.1% of patients with respiratory disorders, 12.9% of patients with circulatory system disorders, 10.2% of patients with gastrointestinal disorders, and about 10 ,2% of patients with disorders of the hepatobiliary system. Epidemiological data on hypoalbuminemia in Indonesia are generally still limited. In Indonesia, malnutrition hospital data shows that 40-50% of patients have hypoalbuminemia or are at risk of

hypoalbuminemia, 12% of them are severe hypoalbuminemia, and the hospitalization period for patients with hospital malnutrition shows 90% longer than patients with good nutrition. Research by Kurniawan W, et al (2014) with a *retrospective cohort design* at a national referral hospital in Jakarta showed hypoalbuminemia in the elderly inpatient population with community pneumonia was 71.1% of 142 patients.

A meta-analysis found that for every 10 g/L decrease in serum albumin, mortality increased by 137% and morbidity increased by 89%. Research in 2014 in hospitals in Brazil showed that 9 and 10 elderly patients who were hospitalized experienced a decrease in serum albumin (Brock et al, 2016). In addition, not only reflects the nutritional status of the body,

albumin also represents the level of inflammation that occurs (Rosyidi et al. , 2019 ). Decreased albumin levels can be associated with a decrease in the immune system and slow healing of tissues/wounds due to infection. The decrease in the immune system can be seen through indicators in the form of phagocytosis by white blood cells, antimicrobial proteins and the inflammatory response (Hamidin, 2014) . Neutrophils are the first cellular defenses whose numbers increase when inflammation occurs. Research Huang, J (2020) showed that there was a significant correlation between albumin levels and neutrophil inflammation indicators in patients with hypoalbuminemia with Covid-19. Other research shows the condition Hypoalbuminemia that reflects malnutrition results in reduced T lymphocyte activity . According to Aneja (2011), lymphocyte disorders and a decrease in the number of lymphocytes in the circulation and tissues result in organ failure. Several studies have shown that giving snakehead fish extract (*Channa striata*) in the diet of hypoalbuminemic patients can increase albumin values. Snakehead fish (*Channa striata* ) has a very high protein content when compared to other types of freshwater fish (Aisyatusoffi and Abdulgani, 2013). Research by Pratasari, et al (2017) stated that there are 15 types of amino acids found in snakehead fish protein which includes 9 types of essential amino acids. In addition to increasing albumin levels , several studies have shown an effect on the value of neutrophils and lymphocytes. Research by Pettalolo, S. R (2015) showed that there was an increase in the number of lymphocytes in the intervention of supplementing with snakehead fish extract 1500 mg and vitamin C 300 mg for 4 weeks. The potency of *Channa striata* (ECS) extract has been shown to have great potential in increasing the levels of albumin and amino acids in the blood.

Based on the description of the background, the researcher conducted a literature study on the effect of giving snakehead fish (*Channa striata*) extract on albumin, neutrophil, and lymphocyte levels in hypoalbuminemic patients.

## METHODS

The type and method used is a literature study (*Systematic Literature Review*). Database search using *Google Scholar* , *Pubmed*, *research gate* ,

and *scientists direct*. Journals are selected based on inclusion and exclusion criteria, then tested using *critical appraisal* by following the journal selection stages on the PRISMA ( *Preferred Reporting Item for Systematic Reviews and Meta-Analytic* ) diagram with the journal selection stages including: identification, screening, spesification, and include.

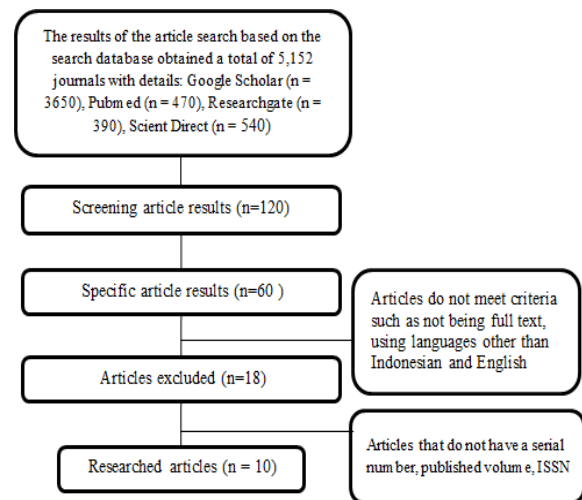


Figure 1. Prism Diagram

## RESULTS

### A. Study Characteristics

Based on the search results, there are 10 articles that meet the inclusion criteria related to the topic of the Literature Review. Journals that discuss the effect of giving snakehead fish extract to albumin levels (4 studies), the effect of giving snakehead fish extract to neutrophils (3 studies), the effect of giving snakehead fish extract to lymphocytes (2 studies), and there is one journal that discusses two variables, namely albumin and lymphocyte levels. The results can be seen in table 1.

### B. Characteristics of Respondents

Respondents in this study were patients with hypoalbuminemia and experimental animals. There are more than ten respondents in the study with an average age of 2-75 years, both male and female woman. There are 10 journals studied that show differences in the age characteristics of respondents with the largest frequency of

respondents aged 18-75 years. There are 3 out of 10 journals showing that the male gender has the highest hypoalbuminemia compared to the female gender. There are 4 journals using

experimental animals, 2 of which show the characteristics of male wistar rats weighing 200-250 grams, and active movement in healthy conditions.

**Table 1. Journal of Extraction Results Effect of Giving Snakehead Fish Extract on Albumin Levels, Neutrophil, and Lymphocytes**

No	Author and year	Frequency of Giving	Results
1.	Roza Mulyana, et al (2017)	<i>Freeze dried snakehead</i> fish extract 10 grams (2 sachets) for 14 days	The results of the study show that there is a significant increase on albumin levels (P=0.003 ) with a mean of 0.5 g/dL.
2.	Geniza G, and Heru Muryawan (2015)	VipAlbumin 2 x 150 mg capsules for 14 days	The results of the study showed that there was an increase in albumin levels ( $p = 0.015$ ) with a mean (0.92±1.105 g/dL ) in the treatment group.
3.	Muhammad Heru Muryawan, et al (2019)	EIG supplement 2 x 500 mg for 21 days	The results of the study showed that there was an increase in albumin levels (3.6 ± 0.8 g/dL higher than the control 3.2 ± 0.8 g/dL (p<0.05))
4.	Rohadi M Rosyidi, et al (2019)	2 capsules 3x/day for 8-14 days	Snakehead fish extract can increase serum albumin levels. Postoperative and post-treatment albumin levels had a significant difference (0.001)
5.	Sri Sustenance Pettalolo (2015)	Pujimin capsules 1500 mg for 4 weeks	The results of the study showed an increase in albumin levels in the treatment group (0.5 ± 0.7 g/L) only after administration of snakehead fish and vitamin C.
6.	Riski Aguztin, et al (2016)	Concentration 25%, 50%, 100% for 3 days	There was a decrease in neutrophils in the treatment group ( 0.7 ± 0.98 ) with a concentration of 100%.
7.	Farhana Nur Fadhila, et al (2018)	Concentration 25%, 50%, 100% for 3 days.	There was a decrease in neutrophils in the treatment group ( 32.50±.85) with a concentration of 100%
8.	Nurpudji Astuti Taslim, et al (2022)	Pujimin capsules 81 mg/day for 10 days	Snakehead fish extract can reduce neutrophils on day 10 (23.22%) in hyperglycemic rat wound injury , but this result was not significant (p>0.05)
9.	Vivien Novarina Kasim, et al (2017)	3 x 2 capsules/day for 14 days	The results of the study showed a significant difference in intervention group (p=0.034) with a mean increase of 0.2 g/dl
10.	Arisa Izzaty, et al (2014)	Concentration 25%, 50%, 100% for 7 days.	The results of the study showed a decrease in the number of lymphocytes in the inflammatory phase ( 3.8 ± 2,546 ) with a concentration of 100%

## DISCUSSION

### A. Effect of Giving Snakehead Fish Extract (*Channa striata*) on Albumin Levels

Based on 5 journals, patients with hypoalbuminemia occur in elderly patients, nephrotic syndrome, post-surgery, and HIV/AIDS. The average frequency of administration is 14-21 days. This is because albumin is a serum protein synthesized in the liver with a half-life of approximately 21 days (Soemantri, 2009). From 5 journals, the most dominant influence on the nephrotic syndrome group and the most significant increase was the administration of snakehead fish extract at a dose of 2x500 mg/day for 21 days (Muryawan, 2019). This indicates that the greater the dose and duration of administration of snakehead fish extract, the more effective the increase in albumin. Nephrotic syndrome causes the body to lack albumin, so that amino acids from the metabolism of snakehead fish extract are used for albumin synthesis. The level of albumin synthesis in children with nephrotic syndrome is higher than in normal children. The administration of snakehead fish extract containing *leucine branched chain amino acid* (BCAA) has a unique effect on activating *the mammalian target of rapamycin* (mTOR) so that it plays a role in ensuring adequate plasma albumin levels. Muryawan's research (2019) is in line with Gilda, G and Heru, M (2015) that serum albumin levels in patients with nephrotic syndrome, the group receiving snakehead fish extract experienced a significant increase. The increase in albumin levels was due to snakehead fish containing essential amino acids and better digestibility compared to vegetable protein because snakehead fish did not contain fiber. Snakehead fish contains amino acids, minerals, vitamins, and fatty acids, therefore various benefits include anti-inflammatory and antioxidant, in addition to acting as a source of protein.

Research by Mulyana, et al. (2017) the effect of giving snakehead fish extract in elderly patients with hypoalbuminemia showed that snakehead fish extract was associated with increased levels of albumin and IGF-1 levels. The elderly are at risk for

malnutrition due to dietary restrictions and the catabolic conditions associated with their illness. IGF-1 levels are inversely related to markers of inflammation and oxidative stress and are then positively regulated by specific nutrients such as zinc, magnesium, selenium, along with energy and protein. Administration of snakehead fish extract led to higher levels of IGF-1 thereby reducing inflammation in patients, which may explain the correlation with increased albumin levels.

Research by Rosyidi, et al (2019) in 37 patients there were 12 men and 25 women, most of the patients spent 8-14 days for postoperative control found that preoperative and postoperative serum albumin levels did not have a significant difference. However, postoperative and post-treatment albumin levels had significant differences. Strict perioperative nutritional support and use of immune-modulating formulas have been shown to reduce complications after major surgery and hospitalization.

### B. Effect of Giving Snakehead Fish Extract (*Channa striat*) on Neutrophil

Based on 3 journals that examined the administration of snakehead fish extract on the value of neutrophils in rats with an inflammatory phase, it showed that there was a significant effect. However, this study has not been able to show its effect on reducing neutrophils in patients with hypoalbuminemia. The structure of the rat liver is similar to that of humans, although human hepatocytes are thicker and well defined than rat hepatocytes, and have a portal triad of v. port, a. Hepatica and bile ducts are similar to humans (Rogers, et al., 2012). So there is a difference in the determination of the dose in humans and mice. Determination of the dose of white rats based on Lawrance & Bacharach (1964) in Fatmawati 2018 by converting the dose that is generally drunk by humans (200 ml) with a conversion factor of 0.018 for mice.

Based on 3 journals, it was found that the average number of neutrophils in rats given

100% snakehead fish extract decreased more. According to Fadhila, et al (2018) that the content of unsaturated fatty acids in snakehead fish extract in the inflammatory phase can regulate postglanidin synthesis which acts as a blood vessel vasodilator so that it regulates infiltration, neutrophil activation and can induce healing. This is supported by Sulistiawati (2018) that the more concentration of the active substance given, the more it decreases acute inflammatory cells.

The decrease in the average number of neutrophils in the treatment group of snakehead fish extract 25%, 50% and 100% was due to the presence of compounds in snakehead fish extract such as albumin, unsaturated fatty acids, minerals zinc (Zn), copper (Cu), and iron. (fe) (Agustin, et al, 2016). The content of compounds in snakehead fish acts as an anti-inflammatory effect that can increase albumin levels and reduce the number of neutrophils in hypoalbuminemia who are injured. Taslim et al (2022) research on hyperglycemic rats with wounds showed that the intervention group on day 10 experienced a decrease in neutrophils and an increase in albumin and lymphocyte values. A decrease in the percentage of neutrophils occurs when there is a decrease in the signal from the proinflammatory sticonyl-17 that suppresses its production in the bone marrow. An increase in albumin indicates that the body can resume its physiological function of synthesizing albumin when inflammation is reduced.

### **C. Effect of Giving Snakehead Fish Extract (*Channa striata*) on Lymphocytes**

Decreased albumin levels can be associated with a decrease in the immune system and slow healing of tissues/wounds due to infection. Snakehead fish extract contains essential amino acids and as a source of antioxidants, where food sources of antioxidants are part of the components of the immune system. Research by Kasim, et al (2017) the addition of extract snakehead fish in the intervention group had an effect greater effect on the decrease in  $TNF\alpha$  value, so it can be said that the effect of the amino acids contained in the supplement can activate T

lymphocyte cells to inhibit various functions of activated macrophages. Giving snakehead fish extract dose 3x2 for 14 days showed that the immune function test by calculating TLC, got significantly different results between the intervention group and the control group ( $p=0.034$ ) with an average increase before and after the intervention in the intervention group of 990.54 cells. /mm.

Research by Izzaty, et al (2014) showed that the extract of haruan or snakehead fish could reduce the number of inflammatory phase lymphocytes in the healing process of the buccal mucosa of wistar rats with the best concentration of 50%. The content of albumin, Zn, Fe, Cu and unsaturated fatty acids are useful in reducing inflammation. Low albumin can cause low blood osmotic pressure, resulting in fluid seepage in the blood vessels . Therefore, the administration of snakehead fish extract is quite effective in giving hypoalbuminemia patients with inflammatory conditions, sepsis, and several other diseases to reduce the number of lymphocytes in the body when it increases.

Research by Pettalolo, S. R (2015) conducted an intervention in providing supplements of snakehead fish extract 1500 mg and vitamin C 300 mg for 4 weeks in 36 HIV/AIDS patients, including 5 patients with hypoalbuminemia. The increase in the number of lymphocytes in the snakehead fish extract group was associated with the presence of zinc which is known to affect immune function, restore the organism's immunity by increasing the activity of the catalase *enzyme and superoxide dismutase* (SOD) enzyme, then increasing the production of lymphokines, causing lymphocyte cells to be able to differentiate and proliferate.

### **CONCLUSIONS**

The content of amino acids, albumin, Zn, Fe, Cu and unsaturated fatty acids in snakehead fish (*Ophiocephalus striatus*) is quite effective as an effort to increase albumin levels, decrease neutrophil and lymphocyte values when

inflammation occurs in hypoalbuminemic patients.

1. Giving snakehead fish ( *Channa striata* ) extract at a dose of 2x500 mg for 21 days is quite effective as an effort to increase albumin levels in hypoalbuminemic patients.
2. The administration of snakehead fish ( *Channa striata* ) extract is quite effective as an effort to reduce the neutrophil value with a concentration of 100% in wistar rats, but has not shown any effect on hypoalbuminemic patients.
3. Giving snakehead fish ( *Channa striata* ) extract at a dose of 1500 mg for 4 weeks is quite effective as an effort to reduce lymphocyte values during inflammation and increase lymphocyte values in hypoalbuminemic patients.

#### SUGGESTION

Further research is needed on the dose and duration of administration of neutrophil values in patients with direct hypoalbuminemia so that the results provided are more meaningful.

#### REFERENCES

- Agustin, R., et al. 2016. Effectiveness of Haruan Fish Extract ( *Channa striata* ) and Ibuprofen on the Number of Neutrophil Cells in Wound Healing Process. *Journal of Dentistry*, Vol 1 (1): 68-74
- Aisyatussoffi N, Abdulgani. Effect of Snakehead Fish Extract ( *Channa striata* ) on the histological structure of the pancreas and blood glucose levels of hyperglycemic mice ( *Mus musculus* ). *Pomits Journal of Science and Arts*. 2(1):2337-3520
- Akirov et al. Low Albumin Levels Are Associated with Mortality Risk in Hospitalized Patients. *The American Journal of Medicine*. 2017;130(12).
- Aneja et al. 2011. American College of Critical Care Medicine Clinical Practice Parameters for Hemodynamic Support of Pediatric and Neonatal Septic Shock. *Critical Care Medicine*, 45:1061-1093
- Fadhila, FN, et al. 2018. The Effectiveness of Giving Haruan Fish Extract ( *Channa striata* ) to the Number of Neutrophils in the Healing Process of *Rattus Novergicus*

*Strain Wistar Traumatic Ulcers* .  
*Journal of Dentistry*, Vol 12 (2)

- Fatmawati, et al. 2018. Histological structure of the liver of the white rat ( *Rattus norvegicus* Berkenhout 1769) with the provision of community traditional herbs
- Gilda, Geniza & Heru, M. 2015. Effect of Snakehead Fish Extract Capsule Supplementation on Albumin Levels and Body Weight in Children with Nephrotic Syndrome. *Journal of Medical Hospital*, Vol 3 (1): 47-51
- Huang C, Wang Y, Li X, Ren L, Zhao J, Hu Y, et al. Clinical features of patients infected with 2019 novel coronavirus in Wuhan, China. *Lancet*. 2020;395(10223):497-506.
- Izzaty, A., et al. 2014. Extract of Haruan ( *Channa striata* ) Effectively Reduces Inflammatory Phase Lymphocyte Count in Wound Healing. *Denfacial Journal*, Vol 13 (3) : 176-181
- Kasim, V. N, et al. 2017. Supplementation of Snakehead Fish Albumin Extract on Nutritional Status and Immunity of Stroke Patients. *Indonesian Journal of Clinical Nutrition*, 13 (3) :91-98
- Kurniawan, Wawan. 2014. Hypoalbuminemia in Elderly Patients with Community Pneumonia: Prevalence and Its Effect on Survival. *Department of Internal Medicine FKUI RSPCN*
- Mulyana, R, et al. 2017. The Effect of *Ophiocephalus striatus* Extract on The Levels of igf-1 and Albumin in Elderly Patients with Hypoalbuminemia. *The Indonesian Journal of Internal Medicine*, Vol 49 (4) : 324-329
- Muryawan, M.H, et al. 2019. Effect of Supplementation of Snakehead Fish Extract ( *Channa striata* ) on Albumin Levels, Cholesterol, Remission Time and Relapse Incidence in Children with Nephrotic Syndrome. *Journal of Medical Hospital*, Vol 6 (1): 7-12
- Mustafa A, Sujuti H, Permatasari N, Widodo MA. Determination of nutrient content and amino acid composition of Pasuruan

- Channa striata* Extract. IJSTE. 2013; 2(4): 1-11.
- Pratiwi, AT 2020. The Potential of Snakehead Fish ( *Ophiacephalus stratius* ) to Increase Albumin Levels in Hypoalbuminemic Patients. JIMKI, Vol 8 (3)
- Pratasari C, Yasni S, and Nurilmala M. 2017. Characteristics of Snakehead Fish Protein Potential as Antihyperglycemic. JPHPI. 20(2): 413-23
- Pettalolo, SR 2015. Effects of Snakehead Fish Extract Supplementation and Vitamin C on Hemoglobin, Leukocytes, Lymphocytes, Albumin and BMI Levels in HIV/AIDS Patients. Indonesian Journal of Nutrition, Vol 38 (1) : 41-48
- Rosyidi, RM, et al. 2019. The Effect of Snakehead Fish ( *Channa Striata* ) Extract Capsule to The Albumin Serum Level of Post-operative Neurosurgery Patients. Biomedical & Pharmacology Journal, Vol 12 (2) : 893 – 899
- Soemantri, Tatty Ermin Setiati, 2009. Hematology Emergency. Pelita Insani: Semarang
- Taslim, NA, et al. 2022. Effect of *Channa striata* on Albumin Serum and Neutrophil to Lymphocyte Ratio in Hyperglycemics Rats with Injury: A Randomized Control Study. *Medical Journal of Science* , Vol 10 (A): 450-455