

ARTICLE INFORMATION

Received: March 19, 2025

Revised: March 28, 2025

Available online: March 30, 2025

at: <https://e-jurnal.ipphorr.com/index.php/mchc>

The relationship between nutritional status and meningitis outcomes in children

Hanif Muslim*, Astri Pinilih, Nopi Sani

Malahayati University

Corresponding author: *Email: hanifmuslim2705@gmail.com

Abstract

Background: Meningitis is a central nervous system infection with high morbidity and mortality in children. Nutritional status plays a critical role in immune response and may influence clinical outcomes.

Purpose: To determine the association between nutritional status and clinical outcomes of pediatric meningitis patients.

Method: An analytical observational study with a cross-sectional design was conducted using medical record data of pediatric meningitis patients aged 0–18 years. Statistical analysis was performed using chi-square test and odds ratio (OR).

Results: Among 44 patients, 77.3% had poor nutritional status. Mortality rate was 47.7%. A significant association was found between nutritional status and clinical outcomes ($p=0.007$). Malnourished children had 12.857 times higher risk of death compared to well-nourished children.

Conclusion: Nutritional status significantly affects meningitis outcomes in children. Early nutritional assessment and intervention are essential in management strategies.

Keywords: Children; Clinical Outcomes; Meningitis; Nutritional Status; RSUD Abdoel Moeloek.

INTRODUCTION

Children are the next generation who will inherit leadership in the national, religious, and state sectors. Children need to be educated and cared for optimally within the family so that they can be useful to the nation, state, and religion (Fitriana, 2017). According to Law No. 23 of 2002 concerning Child Protection, a child is defined as a person under 18 (eighteen) years of age, including children still in the womb. Children experience growth and development (Putri, 2019).

Meningitis is an infection of the central nervous system that can cause inflammation of the meninges and potentially lead to serious complications and death, especially in children (Adityoputri, 2022). Pathophysiologically, the inflammatory process in bacterial meningitis can spread to the brain parenchyma and cause permanent neurological impairment (Zainel, Mitchell, & Sadarangani, 2021).

Meningitis is an infectious disease that remains

untreated and remains a problem in developing countries. Globally, an estimated 500,000 cases occur annually, with 50,000 deaths (Borrow, Caugant, Ceyhan, Christensen, Dinleyici, & Findlow, 2017). In Indonesia, the number of suspected meningitis cases in 2015 was 339,279 in 2016, and 353 in 2017 (Maisuri, 2021). Symptoms of meningitis are usually preceded by central nervous system complications, such as brain edema, hydrocephalus, and brain abscess, which affect the cerebrovascular system, accompanied by one or more symptoms of neck stiffness, decreased consciousness, Kernig's or Brudzinski's signs, and inflammation of the meninges, characterized by fever with an acute onset ($>38.5^{\circ}\text{C}$ rectal or 38°C axillary (Batticaca, 2008).

Globally, meningitis remains a health problem with a high burden of morbidity and mortality. The death toll from meningitis in 2019 was reported to

have reached hundreds of thousands worldwide (Wunrow, Bender, Vongpradith, Sirota, Swetschinski, Novotney, & Djalalinia, 2023). In Indonesia, meningitis also remains a cause of death in children, with a significant incidence (Widyastuti, Utami, & Anugrah, 2023).

Several factors are known to play a role in determining the clinical outcome of meningitis, including age, delayed treatment, bacterial etiology, level of consciousness, and comorbid conditions (Assidiqy, 2021). One factor suspected to play a significant role is nutritional status.

Nutritional status is the balance between the body's nutritional needs and intake. An imbalance in nutritional intake can lead to malnutrition, which can impact the immune system (Nur, Suryana, & Yunianto, 2021). Nutrition plays a crucial role in the formation of immune cells, antibodies, and inflammatory mediators needed to fight infection (Calder, 2021). Deficiencies in certain nutrients can reduce the immune response and increase susceptibility to severe infections.

Previous research has shown that malnourished children have a higher risk of poor outcomes in various infectious diseases, including meningitis (Maniruzzaman, Mohsin, Nesa, & Zaman, 2019). Research at Abdul Moeloek Regional Hospital also reported that abnormal nutritional status is associated with an increased risk of mortality in patients with central nervous system infections (Assidiqy, 2021). Furthermore, impaired anthropometric status in pediatric patients with certain underlying diseases is also associated with more severe clinical conditions (Alifia, Puryatni, Melinda, & Tjahjono, 2024).

RESEARCH METHOD

This study was an observational analytical study with a cross-sectional approach (Assidiqy et al., 2021). The study was conducted at Abdul Moeloek Regional Hospital, Lampung Province, using medical records of pediatric patients diagnosed with meningitis during the period 2021–2024.

The population in this study was all pediatric meningitis patients aged 0–18 years treated at Abdul Moeloek Regional Hospital. The sampling technique used total sampling because the population size was less than 100. Therefore, all subjects who met the inclusion and exclusion criteria were included in the study sample (Assidiqy et al., 2021). Inclusion criteria included pediatric patients with a diagnosis of meningitis and complete medical records. Patients with diseases affecting nutritional status, such as genetic or metabolic disorders, and incomplete medical records were excluded from the study.

The independent variable in this study was nutritional status, while the dependent variable was the meningitis outcome (alive or dead). Nutritional status was determined based on anthropometric data recorded in medical records and categorized according to WHO growth curve standards using the weight-for-age, height-for-age, or weight-for-height-for-age index.

Data analysis was performed univariately to observe the frequency distribution and bivariate using the Chi-Square test with the help of the Statistical Package for the Social Sciences (SPSS) program. A p-value <0.05 was considered statistically significant, and the magnitude of the risk was assessed using the Odds Ratio (OR). This study has received ethical approval from the Research Ethics Commission of Abdul Moeloek Regional Hospital, Lampung Province, with the number 515/KEPK-RSUDAM/V/2025.

Hanif Muslim*, Astri Pinilih, Nopi Sani

Malahayati University

Corresponding author: *Email: hanifmuslim2705@gmail.com

DOI: 10.56922/mchc.v4i12.2757

RESEARCH RESULT

Table 1. Characteristics of Respondents (N=44)

Variable	Results	P-value	OR
Age (Mean±SD) (Years)	(6.66 ±5.83) (0-18)		
Infants (0-1)	11/25.0		
Toddlers (1-4)	11/25.0		
School-age children (5-11)	10/22.7		
Teenagers (12-18)	12/27.3		
Gender (n/%)			
Male	23/52.3		
Female	21/47.7		
Nutritional status (n/%)			
Obesity	2/4.5		
Normal	10/22.7		
Underweight	22/50.0		
Severely Underweight	10/22.7		
The Clinical Outcomes (n/%)		0.007	12.857
Survived	23/52.3		
Died	21/47.7		

Table shows that the total sample of 44 children shows that the largest group is adolescents (12–18 years old), namely 12 children (28.6%). The infant group (0–11 months) and toddler group (1–4 years old) each numbered. the majority of patients had poor nutritional status, namely 34 children (77.3%), while good nutritional status was found in 10 children (22.7%). Based on clinical outcomes, 23 children (52.3%) were declared alive and 21 children (47.7%) died.

Using the Chi-Square test, a p-value of 0.007 ($p < 0.05$) was obtained, indicating a significant relationship between nutritional status and meningitis outcomes in children. Furthermore, an Odds Ratio (OR) of 12.857 was obtained, indicating that children with poor nutritional status were 12.857 times more likely to die than children with good nutritional status.

DISCUSSION

The results of this study indicate that the majority of pediatric patients with meningitis have poor nutritional status and that there is a significant association between nutritional status and meningitis outcomes. Children with poor nutritional status have a higher risk of death compared to children with good nutritional status.

Pathophysiologically, inflammation in bacterial meningitis can cause increased intracranial pressure, impaired cerebral perfusion, and nerve tissue damage, leading to neurological complications and death (Zainel et al., 2021). Clinical factors such as level of consciousness,

delay in therapy, and the patient's general condition also influence outcome (Aljuma'ai, Ahmed, Almogahed, Al-Barahi, Al-Hagri, Alnadhary, & Ghabisha 2024).

Nutritional status plays a crucial role in maintaining immune system function. Adequate nutrition is necessary for antibody production, lymphocyte activation, and modulation of the inflammatory response (Calder, 2021). Malnutrition leads to impaired immune function, which increases the risk of severe infections and worsens the course of disease (Nur et al., 2021).

Hanif Muslim*, Astri Pinilih, Nopi Sani

Malahayati University

Corresponding author: *Email: hanifmuslim2705@gmail.com

DOI: 10.56922/mchc.v4i12.2757

These findings align with previous research which showed that malnourished children with severe infections had more severe clinical manifestations (Chisti, 2019). Other research also reported that malnutrition is associated with an increased risk of death in children with bacterial meningitis (Mohsin et al. (2019). Abnormal nutritional status increases the risk of mortality in patients with central nervous system infections at Abdul Moeloek Regional Hospital (Assidiqy, 2021)

Epidemiologically, the high burden of meningitis globally and nationally underscores the importance of identifying modifiable risk factors (Widyastuti et al., 2023). In addition to infectious factors and bacterial virulence, the patient's underlying condition, such as nutritional status, requires special attention (Keats, Das, Salam, Lassi, Imdad, Black, & Bhutta, 2021; Alifia et al., 2024).

Thus, the results of this study strengthen the evidence that nutritional status is an important prognostic factor in determining meningitis outcomes in children. Integrating nutritional status screening into the management of meningitis patients, along with early nutritional intervention, could be a strategy to reduce mortality. This study has limitations due to its retrospective, medical record-based design. However, the results are consistent with previous literature and clinically relevant.

CONCLUSION

The majority of pediatric meningitis patients at Abdul Moeloek Regional Hospital in Lampung Province had poor nutritional status. Death was found in nearly half of the patients. There was a significant association between nutritional status and meningitis outcomes in children ($p < 0.05$). Children with poor nutritional status had a higher risk of death compared to children with good nutritional status. Nutritional status can be an important prognostic factor in determining the clinical outcome of pediatric patients with meningitis, so early nutritional assessment and intervention are needed to increase survival rate.

REFERENCES

- Adityoputri, C. (2022). Diagnosis dan Tatalaksana Meningitis Bakterial Pada Anak. *Journal of Syntax Literate*, 7(10).
- Alifia, R. S., Puryatni, A., Melinda, M., & Tjahjono, H. A. (2024). Hubungan Penyakit yang Mendasari dengan Status Antropometri pada Pasien Poli Anak Rumah Sakit Umum Daerah Saiful Anwar Malang. *Sari Pediatri*, 26(1), 1-8.
- Aljuma'ai, N., Ahmed, F., Almogahed, M., Al-Barahi, H., Al-Hagri, A., Alnadhary, O., & Ghabisha Sr, A. A. (2024). Factors Associated With Mortality Among Hospitalized Children with Acute Bacterial Meningitis in a Resource-Limited Setting: A Retrospective Study. *Cureus*, 16(11).
- Assidiqy, H. P. (2021). Faktor-Faktor yang Berhubungan dengan Luaran Penderita Infeksi Susunan Saraf Pusat di Bangsal Rawat Inap Alamanda RSUD Dr. Hi. Abdul Moeloek Provinsi Lampung.
- Batticaca, B. F. (2008). Asuhan Keperawatan pasien dengan gangguan system persarafan.
- Borrow, R., Caugant, D. A., Ceyhan, M., Christensen, H., Dinleyici, E. C., & Findlow, J. (2017). Meningococcal disease in the Middle East and Africa: Findings and updates from the Global Meningococcal Initiative. *Journal of Infection*, 75(1), 1-11.
- Calder, P. C. (2020). Nutrition, immunity and COVID-19. *BMJ nutrition, prevention & health*, 3(1), 74.
- Chisti, M. J. (2019). Clinical signs of meningitis in malnourished children under 5 years. *Pediatric Infectious Disease Journal*.
- Fitriana, L. B. (2017). Analisis Faktor yang Mempengaruhi Perilaku Ibu dalam Penanganan Demam pada Anak Balita di Puskesmas Depok I Sleman Yogyakarta. *Jurnal Keperawatan Respati Yogyakarta*, 4(2), 179-188.
- Keats, E. C., Das, J. K., Salam, R. A., Lassi, Z. S., Imdad, A., Black, R. E., & Bhutta, Z. A. (2021). Effective interventions to address maternal and child malnutrition: an update of the evidence. *The Lancet Child & Adolescent Health*, 5(5), 367-384.

Hanif Muslim*, Astri Pinilih, Nopi Sani

Malahayati University

Corresponding author: *Email: hanifmuslim2705@gmail.com

DOI: 10.56922/mchc.v4i12.2757

The relationship between nutritional status and meningitis outcomes in children

- Maisuri, N. K. (2021). Karakteristik Pasien Meningitis Di Rsud. Labuang Baji Dan Rsup. Dr. Wahidin Sudirohusodo Makassar Tahun 2018-2021.
- Maniruzzaman, M. D., Mohsin, F., Nesa, M., & Zaman, S. (2019). Effect of malnutrition on immediate outcome of childhood bacterial meningitis: a hospital based prospective cohort study in Bangladesh. *J Nutr Health and Food Eng*, 9(2), 42-47.
- Nur, Z. T., Suryana, S., & Yunianto, A. E. (2021). Hubungan Riwayat Penyakit Dengan Status Gizi: Studi Cross Sectional. *Jurnal Riset Gizi*, 9(1), 16-21.
- Putri, K. K. A. (2019). Gambaran Asuhan Keperawatan Pada Anak Meningitis Dengan Hipertermia Di Ruang Cempaka Iii Rsup Sanglah Tahun 2019 (Doctoral dissertation, Politeknik Kesehatan Kemenkes Denpasar Jurusan Keperawatan).
- Widyastuti, P., Utami, H. N., & Anugrah, M. F. (2023). Meningitis Bakterial: Epidemiologi, Patofisiologi, dan Penatalaksanaan. *Lombok Medical Journal*, 2(3), 74-80.
- Wunrow, H. Y., Bender, R. G., Vongpradith, A., Sirota, S. B., Swetschinski, L. R., Novotney, A., & Djalalinia, S. (2023). Global, regional, and national burden of meningitis and its aetiologies, 1990–2019: a systematic analysis for the Global Burden of Disease Study 2019. *The Lancet Neurology*, 22(8), 685-711.
- Zainel, A., Mitchell, H., & Sadarangani, M. (2021). Bacterial meningitis in children: neurological complications, associated risk factors, and prevention. *Microorganisms*, 9(3), 535.

Hanif Muslim*, Astri Pinilih, Nopi Sani

Malahayati University

Corresponding author: *Email: hanifmuslim2705@gmail.com

DOI: 10.56922/mchc.v4i12.2757