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BURNS

Article

INCREASED NUTRITION INTAKE FROM DAY 1 TO DAY 7 AND ITS CORRELATION WITH LOS IN THE BURN UNIT OF DR. CIPTO MANGUNKUSUMO HOSPITAL JAKARTA

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ABSTRACT

Introduction : Burn patients as well as the critically ill patients experience strong oxidative stress, an intense inflammatory response, and a prolonged months-long hypermetabolic and catabolic response that affect nutritional requirements. This study aimed to investigate the nutrition intake in the acute phase from day 1 to day 7 and the correlation with length of stay (LOS) in burn patients at Dr. Cipto Mangunkusumo Hospital.
Method : This cross-sectional study was conducted from January to December 2020 in the Burn Unit of Dr. Cipto Mangunkusumo Hospital. Research subjects were burns patients who were willing to take part in this research and met the research criteria. The characteristics data included gender, age, burn area, cause of burns, body mass index, and intake analysis were obtained from medical records and were analyzed using Spearman's correlation and linear regression.
Result : A total of 68 subjects were included in this study. There was an increase in energy intake from day 1 to day 7 of 10.81 + 12.73 Kcal/kgBW. There was a significant negative weak correlation between energy changes from day-1 to day-7 and length of stay (r = -0.25, p = 0.03).
Conclusion: The higher energy increases within 7 days of treatment, the shorter the LOS of burn patients. Further research is still needed to assess the components that influence nutrition intake and how they impact the clinical outcome of burn patients.

Keywords: *Burns; Nutritional Intake; Length of Stay*

Latar Belakang: Pasien luka bakar serta sakit kritis mengalami stres oksidatif yang kuat, respons inflamasi yang intens, dan respons hipermetabolik dan katabolik selama berbulan-bulan yang memengaruhi kebutuhan nutrisi. Penelitian ini bertujuan untuk mengetahui asupan nutrisi pada fase akut dari hari ke-1 sampai hari ke-7 dan hubungannya dengan lama rawat inap (LOS) pada pasien luka bakar di RSUD Dr. Cipto Mangunkusumo.
Metodologi: Ini adalah studi Cross-Sectional yang dilakukan pada bulan Januari hingga Desember 2020 di Unit Luka Bakar RSUP Dr. Cipto Mangunkusumo. Subyek penelitian adalah pasien luka bakar yang bersedia mengikuti dan memenuhi kriteria penelitian. Data karakteristik meliputi jenis kelamin, umur, luas luka bakar, penyebab luka bakar, indeks massa tubuh, dan analisis asupan diperoleh dari rekam medis. Data dianalisis menggunakan korelasi Spearman dan regresi linier.
Hasil: Sebanyak 68 subjek dilibatkan dalam penelitian ini. Terjadi peningkatan asupan energi dari hari ke-1 ke hari ke-7 sebesar 10,81 + 12,73 Kkal/kgBB. Ada korelasi negatif yang signifikan antara perubahan energi dari hari ke-1 sampai hari ke-7 dan lama tinggal (r = -0,25, p = 0,03).
Kesimpulan: Semakin tinggi peningkatan energi dalam 7 hari perawatan, semakin pendek lama tinggal pasien luka bakar di rumah sakit. Penelitian lebih lanjut masih diperlukan untuk menilai komponen yang mempengaruhi asupan nutrisi dan bagaimana pengaruhnya terhadap luaran klinis pasien luka bakar.

Kata Kunci: *Luka Bakar; Asupan Gizi; Lama Tinggal*

Conflicts of Interest Statement:
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INTRODUCTION

Burn is defined as skin tissue damage or loss caused by contact with high temperatures such as hot water, fire, radiation, electric current, chemicals, or extremely low temperatures.[1] According to World Health Statistics 2018, burns kill approximately 180.000 people each year. Non-fatal burn injuries are the leading cause of morbidity.[2] At Dr. Cipto Mangunkusumo Hospital, Jakarta 414 patients were treated from January 2013 to December 2015, with the overall mortality rate of around 24%.[3]

Burn patients as well as critically ill patients experience a strong oxidative stress, an intense inflammatory response, and a prolonged months-long hypermetabolic and catabolic response that affect nutritional requirements.[4] Theoretically, critically ill patients go through an acute phase and a post-acute phase. The acute phase consists of an early period and a late period. The early period of the acute phase, also known as the ancient ebb phase, has metabolic instability and a severe increase in catabolism as its characteristics. The late period of the acute phase, also known as the ancient flow phase, has significant muscle wasting and a stabilization of the metabolic disturbances as its characteristics. An early acute phase may happen on day 1 to day 2 and a late phase on day 3 to day 7. Once a patient gets improvement and rehabilitation or a persistent inflammatory/catabolic state and prolonged hospitalization, they enter the post-acute phase. Fulfilling the nutritional needs of critically ill patients is not an easy task. There are various factors to consider. [5]

Currently, there is no study regarding the nutrition intake data of burn patients at Dr. Cipto Mangunkusumo Hospital, Jakarta, and the relationship with clinical outcome. Therefore, we conducted this observational research to get data on nutrition intake in the acute phase from day 1 to day 7 and the correlation with length of hospital stay (LOS) in burn patients at Dr. Cipto Mangunkusumo Hospital.

METHOD

This cross-sectional study was conducted from January to December 2020 in the Burn Unit of Dr. Cipto Mangunkusumo Hospital Jakarta. Research subjects were burns patients who were willing to take part in this research and met the research criteria. The inclusion criteria were burns patients who were hospitalized at last 24 hours based on electronic health record (EHR), age ≥18 years, patient or family was agree to fill and sign the informed consent, patient was in stable hemodynamic condition with indicator of mean arterial pressure (MAP) > 65 mmHg. The exclusion criteria were that patients refused to participate in this study, were treated for less than 7 days, or were pregnant. This study was approved by the Ethics Committee of Universitas Indonesia No: KET-39/UN2.F1/ETIK/PPM.00.02/2020. Informed consent was obtained in accordance with the Declaration of Helsinki standards. The consecutive sampling method was used.

The characteristics data, including gender, age, burn area, cause of burns, body mass index, and intake analysis, were obtained from medical records. Data was analysed using SPSS, version 20.0 (IBM Corp, USA). Descriptive statistics were presented as mean and standard deviation for data with a normal distribution, and median and minimum-maximum range for data without a normal distribution. Categorical data were presented in accordance with their classification. Spearman's correlation and linear regression were performed to analyse the bivariate.

RESULTS

There were 74 eligible patients to participate. Six of them were excluded due to having been treated for less than 7 days. The Covid-19 pandemic caused a delay in the data collection. A total of 68 subjects were included in this study. Table 1 displays data on the characteristics of subjects.

The nurse recorded the patient's food intake from oral, enteral, and parenteral sources. Clinical nutrition physicians converted that data into energy (in calories per kilogram body weight), protein (in grams per kilogram body weight and in percentage to energy intake), lipids (in percentage to energy intake), and carbohydrates (in percentage to energy intake) in the medical record. Tables 2 and 3 show the nutrition intake data on days 1 and 7 of these research subjects in hospital.

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Table 1. Data Characteristics

Subjects characteristics	Results
Gender (n=68)	
- Male	44 persons (64,7 %)
- Female	24 persons (35,3 %)
Distribution of Age (year) (n=68)	
- 18-60 years	62 person (91,1 %)
- > 60 years	6 person (8,9 %)
Distribution of BMI (kg/m^2)	
- Underweight (<18,5)	9 person (13,2 %)
- Normal (18,5-22,9)	20 person (29,4 %)
- Overweight (23-24,9)	16 person (23,5 %)
- Obese (>25)	23 person (33,8 %)
Burns area (n=68)	
- <20%	19 person (27,9 %)
- ≥20%	49 person (72,1%)
Cause of burns (n=68)	
- Fire	52 person (76,5 %)
- Hot water	1 person (1,5 %)
- Electrical	10 person (14,7 %)
- Chemical	1 person (1,5 %)
- Contact	4 person (5,9 %)

Table 2. Nutrition Intake Day 1

Variable	Result
Energy (Kcal/kgBW)	14.37 ± 10.59
Protein (g/kgBW)	0.50 (0.00 – 2.20)
Protein (%)	17 (0 – 29)
Lipid (%)	25 (0 – 45)
Carbohydrate (%)	59 (0 – 100)

Table 3. Nutrition Intake Day 7

Variable	Result
Energy (Kcal/kgBW)	25.18 ± 11.63
Protein (g/kgBW)	1.10 + 0.54
Protein (%)	17 (0 – 27)
Lipid (%)	26 (0 – 39)
Carbohydrate (%)	56 (25 – 100)

To find out the change between nutrition intake on day 1 and day 7, we calculated the difference and analyzed it statistically. Data on the nutrition change from day 1 to day 7 is presented in Table 4.

Table 4. Change of Nutrition from Day 1 to Day 7

Variable	Result
Energy (Kcal/kgBW)	10.81 ±12.73
Protein (g/kgBW)	0.48 + 0.60
Protein (%)	1 (-15 – 24)
Lipid (%)	1 (-37 – 29)
Carbohydrate (%)	-3.5 (-56 – 98)

The data for the length of stay was taken from the medical record. The median of length of stay was 11 days, with a minimum and maximum length of 7 and 43 days, respectively. We correlate the nutrition intake of day 1 and day 7 and their change with the LOS in tables 5, 6, and 7.

Table 5. Correlation between Nutritional Intake on Day 1 and Length of Stay

Variable	Length of Stay	
	r (Spearman Correlation)	p
Energy (Kcal/kgBW)	0.14	0.25
Protein (g/kgBW)	0.11	0.33
Protein (%)	0.08	0.49
Lipid (%)	0.13	0.28
Carbohydrate (%)	0.00	0.96

Table 6. Correlation between Nutritional Intake on Day 7 and Length of Stay

Variable	Length of Stay	
	r (Spearman Correlation)	p
Energy (Kcal/kgBW)	-0.16	0.17
Protein (g/kgBW)	-0.13	0.27
Protein (%)	0.00	0.99
Lipid (%)	0.23	0.05
Carbohydrate (%)	-0.06	0.59

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Table 7. Changes in nutritional intake from Day 1 to Day 7 and its correlation to Length of Stay

Variable	Length of Stay	
	r (Spearman Correlation)	p
Energy (Kcal/kgBW)	-0.25	0.03
Protein (g/kgBW)	-0.16	0.17
Protein (%)	-0.07	0.52
Lipid (%)	0.01	0.90
Carbohydrate (%)	-0.09	0.44

DISCUSSION

Data Characteristics

There were more male subjects than females in this research. This male predominance result was similar to the previous study. The male to female ratio is around 2:1.[1,6-8] Males are exposed to higher environmental and occupational risks due to their activities than females.[9–12]

Energy Intake

The average energy intake on day 1 was 14.37 + 10.59 Kcal/kgBW and 25.18 + 11.63 Kcal/kgBW on day 7. There was an increase of 10.81 + 12.73 Kcal/kgBW in energy intake from day 1 to day 7. The energy intake of burn patients on day 7 can reach 100% of the ESPEN guidelines, which is 25-30 kcal per kgBW.[13] JQ Li, et al., 2019 calculated and compared the total energy intake and the ratio of it to the energy target of burn patients. The The energy intake of burn patients was 65.4% of their energy target during post-burn day 3 to 7.[14]

Protein

On average, protein intake was 0.5g/kgBW on day 1 and 1.1g/kgBW on day 7. Protein intake did not achieve the target based on ESPEN guidelines, which is 1.5–2g/kgBW for critically ill patients.[13] The mean percentage of protein on day 1 and day 7 was the same, at around 17% of total calories. This result was still lower compared to the JQ Li et al., 2019 report. The percentage of protein accounted for total energy intake of burn patients was 18.3% on post-burn days 3 to 7.[14]. Oetoro et al, stated that the protein requirement for severe burns is 23-25% of total calories.[15] Further research is needed to determine the factors that influence protein intake in burn patients.

Lipid

The median value of lipid intake was 25% of total energy on day 1 and 26% of total energy on day 7. The results were the same as in the previous study. The lipid intake of burn patients on post-burn days 3 to 7 was around 25.1%.[14] The lipid intake of burn patients in this research was in accordance with ESPEN guidelines, which did not exceed 35% of total energy.[13]

Carbohydrate

The median value of carbohydrate intake was 59% of total energy on day 1 and 56% of total energy on day 7. Another study mentioned the percentage of carbohydrates towards total energy intake of burn patients was 56.8% on post-burn days 3 to 7.[14] According to Prins, carbohydrate requirements in burn patients should be 60-70% of total energy.[16]

Correlation Between Nutritional Intake and LOS

There was no significant correlation between energy intake on day 1 and day 7 with LOS. We found a significant correlation between energy changes from day 1 to day 7 and length of stay ($r = -0.25$, $p = 0.03$). These results indicate that the higher energy increases within 7 days of treatment, the shorter the LOS of burn patients.

Wang Chen-Yu et al., 2018 concluded that in critically ill patients, higher energy intake was associated with lower mortality in patients with high nutrition risk, but this trend was not seen in patients with low nutrition risk. Although patients with low nutrition risk did not benefit from high energy intake, it is suggested that patients with high nutrition risk consume at least 800 kcal/day in order to reduce their mortality rate in the medical ICU.[17]

The main goal of nutritional management in burn patients is to meet the increase in energy requirements caused by the hypermetabolic process. In addition, adequate and proper nutrition is essential to prevent various

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complications.[18] Provision of proper nutrition is an important component of the management of burn patients.[19]

There was no significant relationship between protein, lipid, and carbohydrate intake on day 1 and day 7 with length of stay. The previous study by Demling and DeSanti in 1998 stated there was a significant decrease in the length of stay in patients on the higher protein diet. There was a note that the length of stay was not a reliable indicator of progress because it was also influenced by other factors. 18 Research by Jutba et al., 2022 reported mean protein intake in burn patients was 2 + 0.6 grams per kgBW per day and the median length of stay was 33 (22–715) days. But they did not analyze the relationship between protein intake and LOS.[20]

Pandemi Covid-19 had delayed data collection in this study due to a limitation in access to patients and medical records. The data on burn size was presented as characteristic data, but the statistical analysis towards intake and length of stay was not carried out. This could be the limitation of this study.

CONCLUSION

In conclusion, energy changes from day 1 to day 7 showed a negative weak correlation with length of stay. Further research is still needed to assess the components that influence nutrition intake and how they impact the clinical outcome of burn patients.

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REFERENCES

1. Moenadjat Y. Luka Bakar: Masalah dan Tatalaksana. 4th ed. Jakarta: Fakultas Kedokteran Universitas Indonesia; 2009
2. WHO | World Health Statistics 2018: Monitoring health for the SDGs. WHO Available at: http://www.who.int/gho/publications/world_health_statistics/2018/en/. (Accessed: 24th January 2019)
3. Wardhana A, Basuki A, Prameswara ADH, Rizkita DN, Andarie AA, Canintika AF. The epidemiology of burns in Indonesia's national referral burn center from 2013 to 2015. Burns Open. 2017;1(2):67–73.
4. Natarajan M, Sekhar R. Nutrition in burns patient. IOSR Journal of Dental and Medical Sciences. 2015;14(3):38-54.
5. Singer P, Blaser AR, Berger MM, Alhazzani W, Calder PC, Casaer MP. ESPEN guideline on clinical nutrition in the intensive care unit. Clin. Nutr. 2019; 38: 48–79.
6. Song C, Chua A. Epidemiology of burn injuries in Singapore from 1997 to 2003. Burns. 2005;31:18–26.
7. American Burn Association NBR. American Burn Association 2012:1–139.
8. Pujisriyani Wardhana A. Epidemiology of burn injuries in Cipto Mangunkusumo Hospital from 2009–2010. J Plast Rekonstr. 2010;1:528–31.
9. Mzezewa S, Jonsson K, Aberg M, Salemark L. A prospective study on the epidemiology of burns in patients admitted to the Harare burn units. Burns. 1999;25:499–504.
10. Ansari-Lari M, Askarian M. Epidemiology of burns presenting to an emergency department in Shiraz, South Iran. Burns. 2003;29:579–81.
11. Chien WC, Pai L, Lin CC, Chen HC. Epidemiology of hospitalized burns patients in Taiwan. Burns 2003;29:582–8.
12. Ekrami A, Hemadi A, Latifi M. Epidemiology of hospitalized burns patients in Talaghani Hospital during 2003–2007. Bratisl Lek List 2010;111:384–8.
13. Rousseau AF, Losser MR, Ichai C, Berger MM. ESPEN endorsed recommendations: Nutritional therapy in major burns. Clin Nutr 2013;32:497–502.
14. JQ Li, X Han, MJ Zhang, XB Li, GJ Liu, JQ Zhang, et al. Investigation and analysis of protein and energy intake in adult patients with severe burns]. Chinese Journal of Burns 2019; 35(2):143-147.
15. Oetoro S, Witjaksono FJ, Permadhi I. Tatalaksana nutrisi pada luka bakar. In: Moenadjat Y, ed. Luka Bakar: Masalah dan Tatalaksana, 4th ed. Jakarta: Balai Penerbit FKUI; 2009:285-97.
16. Prins A. Nutritional management of the burn patient. S Afr J Clin Nutr 2009;22:9-15.

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17. Xz Wang CY, Fu PK, Huang CT, Chen CH, Lee BJ, Huang YC. Targeted energy intake is the important determinant of clinical outcomes in medical critically ill patients with high nutrition risk. Nutrients 2018; 10(11): 1731.
18. Clark, A, Imran J, Madni T, Wolf S. Nutrition and metabolism in burn patients. Burns & Trauma 2017; 5:11.
19. Demling RH, DeSanti L. Increased protein intake during the recovery phase after severe burns increases body weight gain and muscle function. J Burn Care Rehabil 1998;19(2)161-8.
20. Jutba A, Kamel A, Cash J, Popp J, Allen A, Roberson L, et al. Impact of an enteral nutrition protocol in critically ill patients with burn injuries. Critical Care Medicine 2022; 50(1): 287.

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