(Jurnal Plastik Rekonstruksi, 2021; Vol 8, No 1, 22-25)

BURNS

CASE REPORT

NUTRITION THERAPY IN TYPE 2 DIABETIC BURN PATIENT

Dian A Ramadhania[1], Aditya Wardhana[2], Wina Sinaga[1], Yohannessa Wulandari[1], Mulianah Daya[1], & Lily I Octovia[1*)]

1. *Department of Nutrition, Dr. Cipto Mangunkusumo Hospital, Faculty of Medicine Universitas Indonesia, Jakarta, Indonesia*
2. *Burn Unit, Division of Plastic Surgery, Dr. Cipto Mangunkusumo Hospital, Faculty of Medicine Universitas Indonesia, Jakarta, Indonesia.*

ABSTRACT

Summary: Severe burn patients experience pronounced metabolic changes that caused hyperglycemia. Other existing metabolic conditions such as diabetes mellitus may worsen this condition. Early, adequate, and personalized nutrition therapy may result in better glycemic control and prognosis.A 44-year-old male with severe burn injury involving 27,5% total body surface area (TBSA) and type 2 diabetes mellitus (T2DM) was given early and diabetes-specific nutrition therapy to meet the recommended energy and protein needs. Lower carbohydrate contents and higher mono-unsaturated fatty acids (MUFA) were components of diabetes-specific nutrition therapy. Desirable blood glucose levels, a positive trend of albumin levels, and reduced inflammatory markers were achieved while being given this nutrition therapy. Sepsis was not diagnosed in this patient. The patient was discharged from the hospital after an improvement in clinical condition. Hyperglycemia commonly occurs in critically ill patients, especially with pre-existing T2DM. The provision of prompt and personalized nutrition therapy will improve clinical outcomes.

Keywords: *Burns; Type 2 diabetes mellitus; Nutrition therapy; Case report*

ABSTRAK

Ringkasan: Pasien luka bakar berat mengalami perubahan metabolisme yang menyebabkan hiperglikemia. Kondisi metabolik lain yang ada seperti diabetes mellitus dapat memperburuk kondisi ini. Terapi nutrisi yang dini, adekuat, dan dipersonalisasi dapat menghasilkan kontrol glukosa dan prognosis yang lebih baik. Seorang laki-laki berumur 44 tahun dengan luka bakar berat 27,5% total luas permukaan tubuh (TBSA) dan diabetes mellitus tipe 2 (DMT2) diberikan terapi gizi dini dan khusus diabetes untuk memenuhi kebutuhan energi dan protein yang dianjurkan. Kandungan karbohidrat yang lebih rendah dan asam lemak tak jenuh tunggal (MUFA) yang lebih tinggi merupakan komponen terapi nutrisi khusus diabetes. Kadar glukosa darah yang diinginkan, tren positif kadar albumin, dan penurunan penanda inflamasi tercapai saat diberikan terapi nutrisi ini. Sepsis tidak didiagnosis pada pasien ini. Pasien keluar dari rumah sakit setelah perbaikan kondisi klinis. Hiperglikemia umumnya terjadi pada pasien sakit kritis terutama dengan DMT2 yang sudah ada sebelumnya. Pemberian terapi nutrisi yang cepat dan dipersonalisasi akan meningkatkan hasil klinis.

Kata Kunci: *Luka bakar; Diabetes melitus tipe 2; Terapi nutrisi; Laporan kasus*

Conflicts of Interest Statement:
The author(s) listed in this manuscript declare the absence of any conflict of interest on the subject matter or materials discussed.

Received: 04 12 2020, Revised: 15 12 2020, Accepted: 11 03 2021

 P-ISSN 2089-6492; E-ISSN 2089-9734 | DOI: 10.14228/jprjournal.v8i1.314

INTRODUCTION

Severe burn injuries are considered critical illnesses with a high risk of morbidity and mortality. Almost half of the patients admitted to the burn unit in Dr. Cipto Mangunkusumo Hospital sustained severe burn injuries with a mortality rate of 34%, mainly caused by sepsis.[1,2] Burn patients with pre-existing T2DM, especially with uncontrolled hyperglycemia, were more likely to have sepsis than nondiabetic burn patients.[3] Hyperglycemia in these patients can also be worsened by systemic inflammatory response typically developed in burn injuries caused by the release of proinflammatory cytokines boosted by counterregulatory hormones actions.

Optimal control of blood glucose levels has been reported to reduce the risk of complications, infection, prolonged hospitalization period, and also mortality in critically ill patients.[4] Compared to patients who only received standard nutrition formula, the use of the disease-specific formula for diabetes in critically ill patients significantly lower pneumonia incidences by approximately 1%, lower insulin requirements and resulted in better blood glucose control.[5] Despite this, disease-specific nutrition therapy is still frequently disregarded. Adequate, early, and personalized nutrition therapy should be included in burn treatment to improve survival of severe burn patients.[6]

CASE REPORT

Forty-four-year-old male suffered from superficial to full-thickness burn 27.5% TBSA caused by flame with pre-existing T2DM. The patient was fully alert and hemodynamically stable, then was adequately resuscitated for the next 24 hours. The patient received early oral feeding within 48 hours of hospital admission. The patient was obese based on BMI classification for Asia-Pacific, the total energy requirement was estimated to be 2500 kcal/day according to Xie formula, and protein requirement was targeted at least 1,5 g/kg BW/day. The patient was initially given 800 kcal (11 kcal/kg BW/day), which gradually increased until 1900 kcal (27 kcal/kg BW/day) on day 10 of hospital care.

A specific diet for diabetes was given, supplemented with enteral formula, also specified for diabetes. Protein was initially given at 0.5 g/kg BW/day, up to 1.5 g/kg BW/day after being supplemented with parenteral amino acids (Kalbamin®). During hospital care, blood glucose levels remained within the desirable range, regulated using basal insulin regimen and nutrition therapy. A comparison between energy, nutrients intake, and random blood glucose is shown in **Figure 1**. Quick sequential organ failure assessment (qSOFA) score of this patient remained below 2; also, no clinical signs of infection were observed, such as prolonged fever; therefore, this patient was not diagnosed with sepsis.

This patient's C-reactive protein (CRP) was first shown to be 442 mg/L and decreased progressively to 60.7 mg/L on day 22 of hospital care. Lactate level was also shown to decrease from an initial level of 3.66 mmol/L to 1.9 mmol/L on day 22 of hospital care. Increment of albumin level from 2.39 g/dL (day 1 of hospitalization) to 3.07 g/dL (day 22 of hospitalization) also happened. The patient also received albumin transfusion to maintain albumin levels above 2.5 g/dL. A bottle of 100 mL albumin 20% was administered intravenously each day, day 1–3, day 7–9, and day 19–21. Supplementation of vitamin B-complex 2 mg (t.i.d), vitamin C 250 mg (b.i.d), folic acid 1 mg per day, and zinc 20 mg per day was given to support wound healing.

DISCUSSION

Early nutrition therapy initiated within 24–48 hours of initial trauma was recommended to improve the prognosis of intensive care patients. Gradual progression to achieve an adequate amount of energy (70–100% of total energy requirement) and protein (minimum 1.5 g/kg/day) was also recommended to support protein synthesis, thereby conserving muscle mass. Greater muscle mass may improve insulin sensitivity since skeletal muscle is a crucial site for glucose uptake.[6] Higher serum albumin level was associated with better outcomes in critically ill patients. Severe hypoalbuminemia may cause

P-ISSN 2089-6492; E-ISSN 2089-9734 | DOI: 10.14228/jprjournal.v8i1.314

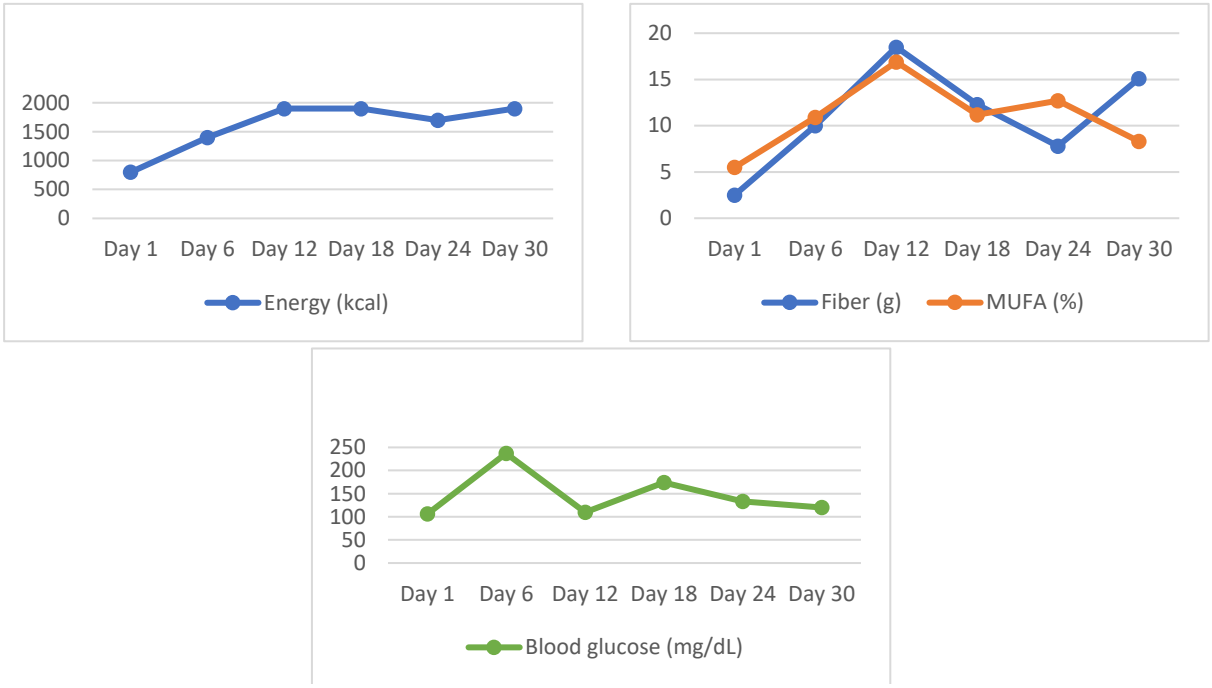

Figure 1. Comparison between energy *(Upper-Left*), nutrients intake *(Upper-Right),* and random blood glucose *(Lower)*. Better glycemic control was achieved through a higher amount of fiber and MUFA intake. MUFA: mono-unsaturated fatty acids.

tissue edema that would delay wound healing, also gut edema that leads to malabsorption. A negative trend in serum albumin level decreases the survival probability of intensive care patients by 70.6%.[7]

A specific diet for T2DM was given to attain the targeted energy while maintaining a desirable range of blood glucose levels between 140–180 mg/dL. Diabetes-specific formulas contain lower percentages of carbohydrates, mainly composed of complex carbohydrates, also contain soluble fiber. These formulas have greater fat contents with a significant proportion of MUFA. Diabetes-specific formulas may improve glycemic control through delayed gastric emptying and gut absorption of carbohydrates, also lower glycemic response. Insulin therapy was commonly used as a mainstay of glycemic control in intensive care patients.[5,8]

The use of diabetes-specific formula decreased the administered dose of insulin in intensive care patients by 5 IU/day. A more significant reduction in plasma blood glucose by 8 mg/dL was also shown compared to the use of non-disease-specified formula.[5] Another study also showed a significant decrease in the frequency of insulin administration by 10.9%, insulin dosage by 9 IU/day, and a 10.8% decrease in blood glucose levels of patients who received diabetes-specific formulas.[8] There is also a shorter intensive care unit (ICU) stay by approximately 2 days.[9]

Nutrition therapy has been shown to mitigate the metabolic changes of critically ill patients and reduce inflammation and the risk of infection. Inflammatory markers such as CRP was shown to be decreased during the provision of nutrition therapy. Lactate as a marker of tissue hypoxia also progressively decreased. Optimal nutrition support will maintain gut mucosal integrity, gut-associated immune function, also prevent gut microbiota translocation, which may cause systemic infection.[6,10] Patient showed improvement in wound also clinical assessment and was discharged from the hospital after approximately a month of hospital care.

P-ISSN 2089-6492; E-ISSN 2089-9734 | DOI: 10.14228/jprjournal.v8i1.314

SUMMARY

Hyperglycemia is a frequent finding in critically ill patients secondary to inflammatory, hormonal, and metabolic factors. This stress-induced hyperglycemia may worsen pre-existing hyperglycemia caused by metabolic conditions such as T2DM contributing to poor prognosis. The diabetes-specific formula has been proven to improve glycemic control and reduce insulin usage. Prompt and adequate nutrition therapy tailored to patient condition and requirement is an essential part of burn injury treatment.

Correspondence regarding this article should be addressed to:
Lily Indriani Octovia. Department of Nutrition, Dr. Cipto Mangunkusumo Hospital, Faculty of Medicine Universitas Indonesia.
Email: lily.indriani@gmail.com

REFERENCES

1. Wardhana A, Djan R, Halim Z, editors. Mortality and causes of death among burn patients at the burn unit of Cipto Mangunkusumo Hospital. 17th European Burns Association Congress; 2017; Barcelona: European Burns Association.

2. 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.

3. Frydrych LM, Fattahi F, He K, Ward PA, Delano MJ. Diabetes and sepsis: Risk, recurrence, and ruination. Front Endocrinol (Lausanne). 2017;8:271–92.

4. Mecott GA, Al-Mousawi AM, Gauglitz GG, Herndon DN, Jeschke MG. The role of hyperglycemia in burned patients: evidence-based studies. Shock. 2010;33(1):5–13.

5. Manejo A, Montejo-Gonzalez JC, Vaquerizo-Alonso C, Lobo-Tamer G, Zabarte-Martinez M, Herrero-Meseguer JI, et al. diabetes-specific enteral nutrition formula in hyperglycemic, mechanically ventilated, critically ill patients: a prospective, open-label, blind-randomized, multicenter study. Crit Care. 2015;19:390–402.

6. Clark A, Imran J, Madni T, Wolf SE. Nutrition and metabolism in burn patients. Burns Trauma. 2017;5:11–22.

7. Kendall H, Abreu E, Cheng AL. Serum albumin trend is a predictor of mortality in ICU patients with sepsis. Biol Res Nurs. 2019;21(3):237–44.

8. Rice TW, Files DC, Morris PE, Bernard AC, Ziegler TR, Drover JW, et al. Dietary management of blood glucose in medical critically ill overweight and obese patients: An open-label randomized trial. JPEN J Parenter Enteral Nutr. 2019;43(4):471–80.

9. Ma A-Q, Pan L, Gao Z-W, Zhu Q, Wang M, Qin H-L. Effects of enteral nutritional suspension for diabetes mellitus and homogenized meals on length stay etc of critically ill patients. Chin J Clin Nutr. 2012;20:285–90.

10. Natarajan M. Recent concepts in nutritional therapy in critically ill burn patients. Int J Nutr Pharmacol Neurol Dis. 2019;9:4–36.

P-ISSN 2089-6492; E-ISSN 2089-9734 | DOI: 10.14228/jprjournal.v8i1.314