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THE ROLE OF SYNBIOTIC SUPPLEMENTATION IN IMPROVING BOWEL MOVEMENT FREQUENCY IN A BURN PATIENT WITH 32% TOTAL BODY SURFACE AREA AND CONSTIPATION: A CASE REPORT

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Abstract

Background: Severe burns cause microbiota dysbiosis, impaired intestinal motility, and constipation, worsening patient conditions and prolonging hospitalization. **Research Objective:** To evaluate the effectiveness of synbiotic supplementation in improving bowel movement frequency in burn patients. **Case Illustration:** A study conducted in the Burn High Care Unit at RSUPN Cipto Mangunkusumo involved a 42-year-old male patient with 32% total body surface area (TBSA) burns and a history of kidney transplantation. Treatments included debridement, skin grafts, electrolyte correction, and synbiotic supplementation starting on day 6. During 29 days, energy intake, fiber intake, bowel movement frequency, and clinical status were monitored, showing significant improvements until discharge. **Discussion:** The 42-year-old male patient with 32% TBSA burns experienced impaired intestinal motility and constipation consistent with microbiota dysbiosis and decreased SCFA due to severe burns. The patient received enteral nutrition and Rillus® synbiotic supplementation from day 6, theoretically enhancing beneficial bacterial colonization and intestinal motility. Bowel movement frequency improved from day 7, indicating synbiotic-related benefits. Micronutrient supplementation according to ESPEN supported wound healing and immunity. Clinical condition and nutritional status improved with significant wound healing until discharge on day 30. **Conclusion:** Synbiotic supplementation effectively increased bowel movement frequency and improved intestinal function in severe burn patients with constipation.

Keywords: Severe burn, microbiota dysbiosis, synbiotic, constipation, intestinal motility, bowel movement frequency.

Introduction

Burn injuries represent a complex health problem with extensive systemic effects on multiple organ systems. The mortality rate associated with burn injuries is markedly high in Southeast Asia (11.6 deaths per 100,000 population per year), compared to a significantly lower rate of 1.0 death per 100,000 population per year in high-income countries.[1] The prevalence of burn injuries in Indonesia, based on the 2007 National Basic Health Research (Riskesdas) data, was reported at 2.2%.[2] At the National General Hospital Dr. Cipto Mangunkusumo (RSCM), the adult population with the highest incidence of burn injuries comprised labor workers, with fire being the predominant cause. Among

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them, 73.9% sustained third-degree burns, and 41.9% presented with a burn area between 11% and 30% of the total body surface area (TBSA).[3] Approximately 36.1% of burn patients with more than 20% TBSA involvement experienced delayed defecation, defined as no bowel movement within six days after admission.[4]

Severe burns, particularly those involving more than 20% TBSA, trigger complex systemic responses that affect multiple organ functions, including the gastrointestinal system. One of the common complications in patients with major burns is impaired intestinal motility, which can manifest as constipation. Constipation in critically ill patients not only reduces comfort and quality of life but is also associated with an increased risk of nosocomial infections, prolonged length of hospital stay, and prolonged use of mechanical ventilation.[5]

Gastrointestinal dysfunction in burn patients arises from a combination of splanchnic hypoperfusion, opioid use, immobilization, electrolyte imbalance, and alterations in gut microbiota due to metabolic stress and antibiotic therapy. Studies have demonstrated that severe burns can lead to gut dysbiosis, characterized by a reduction in Bacteroidetes, an increase in Firmicutes, and the overgrowth of pathogenic bacteria such as *Enterococcus* and *Escherichia coli*.[6] This condition disrupts the production of essential metabolites such as short-chain fatty acids (SCFAs), which play a crucial role in maintaining intestinal motility and mucosal integrity. However, current approaches to managing constipation in burn patients remain limited and largely rely on the use of laxatives, which do not address the underlying microbiota imbalance.

Several studies have suggested that synbiotics may restore microbiota balance, stimulate SCFA production, enhance intestinal motility, and reduce mucosal inflammation.[7] Nevertheless, direct evidence in burn populations remains scarce. Therefore, this case report aims to explore the potential role of synbiotic supplementation in improving bowel movement frequency in a burn patient with constipation treated at the High Care Unit (HCU), Burn Unit, National General Hospital Dr. Cipto Mangunkusumo, during June–July 2025.

Case Illustration

This study was conducted in the High Care Unit (HCU), Burn Unit, National General Hospital Dr. Cipto Mangunkusumo, involving a 42-year-old male patient with superficial dermal to full-thickness burns involving 32% TBSA, affecting the face, anterior and posterior trunk, and bilateral extremities. The patient

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had a history of kidney transplantation in 2021 and was on regular immunosuppressant therapy. During the 30-day hospitalization, the patient underwent four sessions of debridement, three skin graft procedures, packed red cell (PRC) transfusions, electrolyte correction, albumin infusion, antibiotic treatment, routine renal therapy, and psychiatric management. Diagnostic investigations included X-ray, CT scan, and laboratory tests, which revealed hyponatremia, hypokalemia, leucocytosis, hypoalbuminemia, and elevated C-reactive protein (CRP). The patient was categorized as moderately malnourished, with a body weight loss of 3.9 kg (5.7%) over three weeks. Data collection included medical history, physical examination, anthropometric measurements, laboratory findings, and daily records of energy intake, fiber intake, synbiotic supplementation, bowel movement frequency, and clinical monitoring over 29 days.

Table 1, Patient characteristics during monitoring

Patient Profile	
Anthropometric assessment	
Height	170 cm
Body weight	68 kg to 64,1 kg (weight loss of 3,9 kg (5,7%) within 3 weeks
Body Mass Index (BMI)	23,5 kg/m^2 to 22,2 kg/m^2
Nutritional status	Overweight, clinically at risk of malnutrition to moderate malnutrition
Total burn surface area (%)	32%
Debridement	4 times (day 6, day 11, day 19, day 27 of nutritional monitoring)
Skin graft	3 times (day 6, day 19, day 26 of nutritional monitoring)
Constipation during hospitalization	Yes
Use of laxatives during hospitalization	No

Energy requirements were calculated using the Xie formula. Energy and fiber intake were analyzed using *Nutrisurvey*, and the effects of synbiotic supplementation (2 × 1 capsule daily) were monitored starting from day 6 of nutritional care. The results showed a gradual increase in energy intake, improvement in bowel movement frequency beginning on day 7, and progressive improvement in nutritional status as well as clinical condition, until the patient was discharged on day 30 of nutrition

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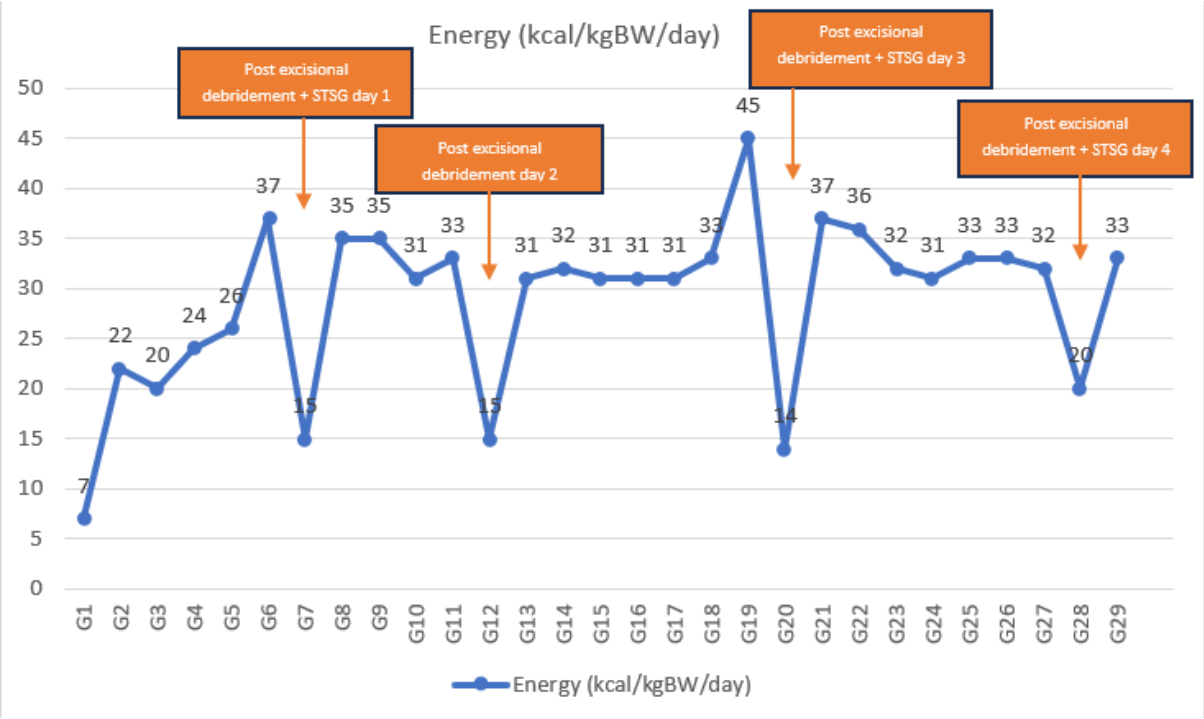

Graph 1. Energy intake during hospitalization

Graph 1 illustrates that during the hospitalization period (days 1–29), the patient's energy intake fluctuated between approximately 7–45 kcal/kgBW/day. A marked decrease in energy intake was observed on the days following surgical procedures (post-excisional debridement with or without STSG), namely on days 7, 13, 20, and 28; however, intake subsequently increased again to ≥30 kcal/kg body weight/day on the following days. Overall, except for these postoperative days, the patient's targeted energy requirements during hospitalization were maintained.

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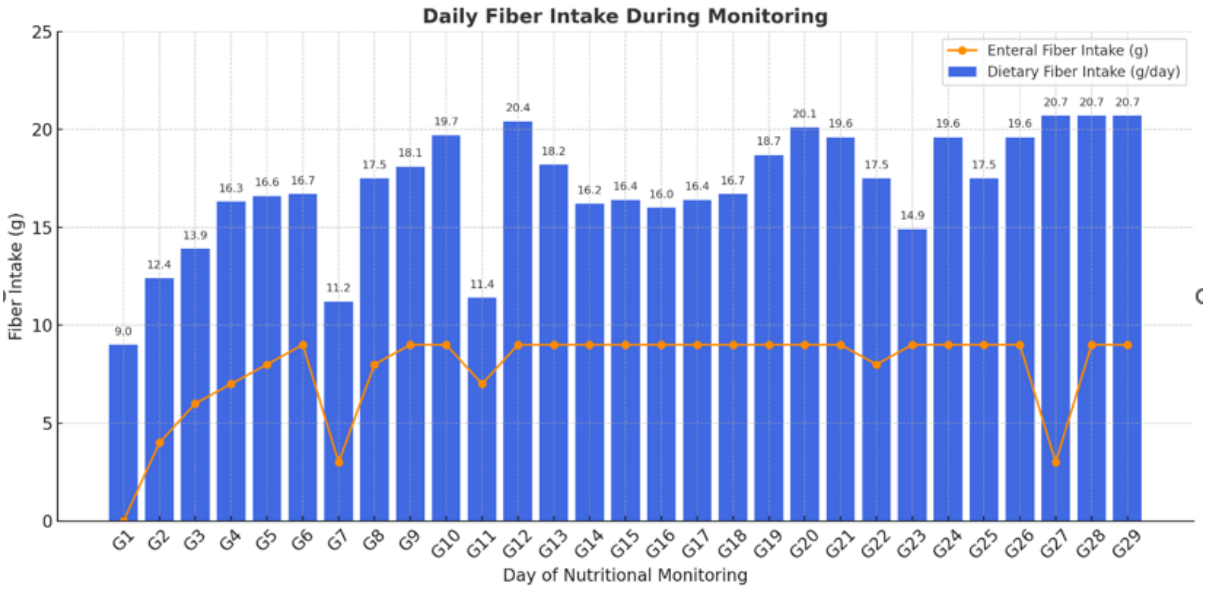

Graph 2. Daily fiber intake during hospitalization

Graph 2 illustrates that during the nutritional monitoring period (day 1–29), daily fiber intake showed an initial increasing trend and then remained relatively stable. Dietary fiber intake ranged from approximately 9 to 21 g/day, with a gradual increase from the start of monitoring and reaching values of around ≥20 g/day from about day 19 until the end of the period. Enteral fiber intake increased from 0 g on the first day to approximately 8–9 g/day on most subsequent days of monitoring.

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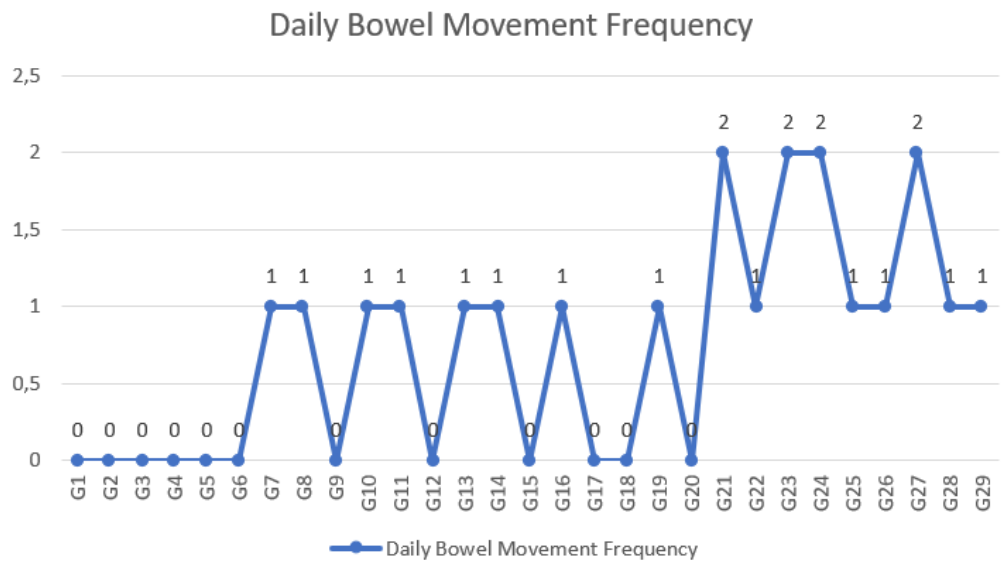

Graph 3. Daily bowel movement frequency during hospitalization

Graph 3 illustrates that during the monitoring period (days 1–29), no bowel movements were recorded on days 1–6. From days 7 to approximately days 20, the frequency of bowel movements ranged from 0 to 1 time per day. During the subsequent days 21–29), the frequency stabilized at 1–2 times per day, with no episodes of diarrhea.

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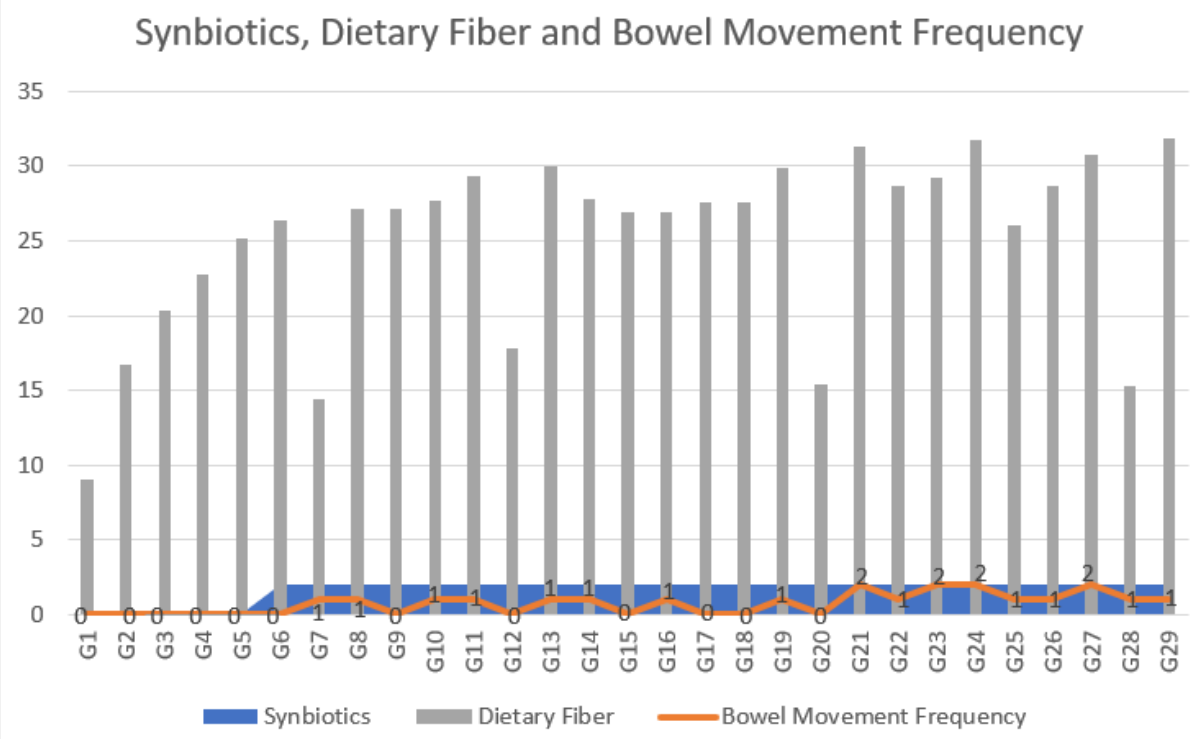

Graph 4, Synbiotics, dietary fiber intake and bowel movement frequency during hospitalization

Graph 4 illustrates the relationship between synbiotic administration, fiber intake, and daily bowel movement frequency. Dietary fiber intake increased from the beginning of the observation period and then remained relatively stable at approximately 20–30 g/day until the end of the study. Synbiotic administration was initiated around day 7 and continued on an almost daily basis thereafter. As fiber intake and synbiotic use became more consistent, the bowel movement frequency, which was initially 0 times/day, increased to 1–2 and appeared more regular during the later phase of treatment.

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Discussion

A 42-year-old male patient sustained burn injuries involving 32% of the total body surface area (TBSA) caused by fire. Nutritional monitoring was conducted for 29 days in the Burn Unit High Care Unit (HCU), during which the patient remained stable until discharge. The patient received soft, solid, and liquid foods as enteral nutrition. Initial nutrition consisted of high-protein liquid diets and rice porridge. However, the patient did not defecate from day 1 to day 6, leading to a diagnosis of constipation.

According to the American Gastroenterological Association, constipation is characterized by bowel movement frequency of fewer than three times per week, a sensation of incomplete evacuation, hard stools, straining, or the need for manual maneuvers.[8] Nassar et al. defined constipation as the absence of bowel movements within the first four days, Trexler within six days, and Christensen within 72 hours of intensive care admission. In this case, the first bowel movement occurred on day 7.[10,11]

Burn injuries represent tissue damage caused by exposure to extreme temperatures (fire, electricity, chemicals, or high heat), which activates a systemic inflammatory response.[13,14] The body initially enters the ebb phase (12–48 hours) characterized by decreased metabolism and peripheral perfusion.[13] Fluid resuscitation is essential to prevent shock. Reduced splanchnic perfusion further decreases intestinal motility. Other contributing factors to constipation include electrolyte imbalance (hypokalemia, hypomagnesemia), immobilization, sedation, analgesic use, and low dietary fiber intake.[15]

Following the ebb phase, the body progresses into the flow phase, marked by hypermetabolism. This phase is associated with negative nitrogen balance, loss of muscle mass, malnutrition, impaired immune function, and increased risk of sepsis.[16] Patients with extensive burns (≥20% TBSA) experience systemic stress that triggers gut dysbiosis, impaired gastrointestinal motility, immobilization, and opioid use, leading to constipation and an increased risk of ileus, which delays recovery and reduces quality of life.

Delayed defecation has also been linked to aggressive fluid resuscitation, which causes bowel wall edema, reduces gastrointestinal smooth muscle contractility, and prolonged intestinal transit.[9,17-19] Additional factors include splanchnic hypoperfusion, electrolyte disturbances, sedation, analgesics, and inadequate fiber intake.[15] Other studies have shown that delayed defecation is associated with the use of sedatives,

surgical interventions, and delayed initiation of enteral nutrition.[20]

The patient received both solid foods and high-protein liquid enteral nutrition. According to ESPEN, enteral nutrition refers to specialized dietary formulas delivered via tube feeding or oral supplementation.[22] Enteral nutrition is effective in burn patients because it supports gut integrity, epithelial cell proliferation, and brush-border enzyme production.[23]

At RSCM, the liquid nutrition for enteral formula contains per 100 mL: 100 kcal, 5.6 g protein, 3.3 g fat, 12 g carbohydrate, and 1.07 g fiber. The RSCM enteral formula contains soluble fiber in the form of inulin, while its insoluble fiber consists of cellulose and hemicellulose derived from soybeans. Dietary fiber includes both soluble and insoluble fractions; soluble fiber such as psyllium, guar gum, and pectin absorbs water, producing bulky, soft stools that are easier to pass, insoluble fiber such as cellulose, hemicellulose, lignin, soy fiber (soy polysaccharide), pea fiber, wheat bran, and corn bran increases stool bulk and promotes bowel movements.[24]

Fiber improves bowel movement frequency by increasing stool bulk, prolonging intestinal transit time, and being fermented into short-chain fatty acids (SCFAs) such as acetate, propionate, and butyrate, which are essential for colonocytes and gut microbiota.[25] During hospitalization, the patient's fiber intake ranged from 9–31.9 g/day, which was below the Indonesian Recommended Dietary Allowance (36 g/day) and the FDA guideline (14 g/1000 kcal).[27,28]

Severe burns increase gut mucosal permeability, promoting bacterial translocation and dysbiosis characterized by reduced Bacteroidetes, increased Firmicutes, and the overgrowth of pathogenic bacteria such as *Enterococcus* and *Escherichia coli*, especially in the early phase. Decline in aerobic and anaerobic butyrate-producing bacteria has also been reported, which play an important role in maintaining gut mucosal integrity.[6,29]

Probiotics help restore gut microbiota balance, maintain barrier integrity through modulation of tight junction proteins such as occludin and claudin-1, and enhance *MUC2* gene expression and mucus secretion. Probiotics also exert immunomodulatory effects by stimulating anti-inflammatory cytokine production and lowering mucosal pH, thereby inhibiting pathogenic bacteria. Prebiotics, in contrast, are oligosaccharides fermented into SCFAs that serve as an energy source for colonocytes and possess anti-inflammatory properties.[30]

The combination of probiotics and prebiotics, known as synbiotics, promotes the colonization of beneficial gut microbes, shortens colonic transit time, and consequently improves bowel frequency and stool consistency. Strains such as *Lactobacillus casei* and *Bifidobacterium lactis* combined with prebiotics have been shown to increase bowel movement frequency and improve stool form. Synbiotics may therefore improve bowel movements in burn patients with constipation through accelerated intestinal transit, increased SCFA production, microbiota modulation, and reduced inflammation, with effective results observed within 2–6 weeks and minimal adverse effects.[30,31]

Waitzberg et al. demonstrated that 30 days of synbiotic supplementation in adult women with constipation significantly improved evacuation frequency and stool consistency without side effects.[32] Another study reported a 75% response rate in synbiotic-treated patients compared to 31% in controls, with significant improvements in both bowel frequency and stool consistency.[34]

In this case, the patient received *Rillus*® synbiotic supplementation starting on day 6 (2 capsules daily), containing *Lactobacillus plantarum, Streptococcus thermophilus,* and *Bifidobacterium longum* (10 billion CFU) along with 480 mg of fructooligosaccharides (FOS). These strains are part of the normal gut microbiota, supporting fermentation, physiological function, and immune regulation. FOS, as a prebiotic, effectively increases beneficial bacteria while suppressing pathogen growth.[38] Meta-analyses suggest effective doses range from 7.5–15 g/day, with optimal outcomes observed after more than four weeks.[7]

The patient's average bowel movement frequency during the 29-day hospitalization was 0–2 times daily, with notable improvement beginning on day 7 following synbiotic initiation. This improvement may indicate a therapeutic effect of synbiotic supplementation. D'Onofrio et al.[34] reported similar findings, with increased bowel frequency, improved stool consistency (from hard to Bristol type 3–4), and reduced bloating, straining, and incomplete evacuation, observed from weeks 2 to 3.

The patient also received oral supplementation of vitamin C (50 mg twice daily), vitamin B complex (2 mg three times daily), folic acid (1 mg daily), and zinc (20 mg twice daily). In severe burns, micronutrient requirements increase due to hypermetabolism, tissue healing, and wound exudation. Oxidative stress and inflammation reduce endogenous antioxidants; therefore, supplementation is

recommended in accordance with ESPEN guidelines.[40]

The patient demonstrated clinical improvement without infectious complications during hospitalization. Leukocytosis was more likely related to chronic burn inflammation rather than active infection. Nutritional improvement was indicated by a better Karnofsky Performance Scale score. Wound healing was significant, with granulation tissue formation and wound closure without secondary infection. Open wound area decreased from 32% to 15% within 20 days. The patient remained stable and was discharged on day 30.

Conclusions and Recommendation

Synbiotic supplementation as part of medical nutrition therapy may provide potential benefits in improving bowel movement frequency in patients with severe burns (32% TBSA) complicated by constipation during hospitalization. The combination of *Lactobacillus plantarum, Streptococcus thermophilus, Bifidobacterium longum,* and fructooligosaccharides (FOS) is thought to help restore gut microbiota balance, enhance SCFA production, and improve gastrointestinal motility impaired by systemic inflammation, opioid use, and hypermetabolic conditions following burn injury.

The observed improvements in bowel movement frequency and stool consistency after synbiotic supplementation highlight its potential clinical relevance, particularly when integrated into comprehensive medical and nutritional management. This supports the role of microbiota-targeted interventions in addressing gastrointestinal dysfunction in burn patients.

Long-term clinical evaluation and monitoring are warranted to further assess the efficacy of synbiotics, including bowel motility response, stool consistency, and patient tolerance. An individualized nutritional approach, incorporating assessment of fiber intake, electrolyte balance, hydration, and medication effects (e.g., opioids), is crucial for constipation management in burn patients. Multidisciplinary collaboration between clinical nutritionists, burn surgeons, pharmacologists, and nursing staff is essential to optimize the integration of synbiotic therapy into critical burn care protocols.

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Competing Interest

The authors declare that there are no competing interests related to the study.

Author's Contribution

All authors have made equal contributions to the preparation and writing of this case report.

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