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Original Article

The Role of Nutrition Therapy in Recovery from Severe Burns: A Case Report from Muhimbili National Hospital, Mloganzila

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ABSTRACT

Background: Severe burn injuries are associated with profound hypermetabolic and catabolic responses that significantly increase nutritional requirements. Effective nutritional management is crucial for promoting wound healing, minimising complications, and improving recovery outcomes, especially in resource-limited settings. **Purpose:** This case report aims to highlight the practical and individualised nutritional strategies used to manage a patient with extensive burn injuries in a low-resource ICU setting. **Methods:** A 30-year-old male was admitted to Muhimbili National Hospital–Mloganzila following a motor traffic accident, sustaining deep second-degree burns over 53% of his total body surface area (TBSA), including the trunk, back, forearms, lower limbs, and buttocks. Upon admission, he presented with fluid imbalance, hypoalbuminemia, and functional feeding limitations. Nutritional needs were calculated using the Curreri formula, and a tailored nutrition care plan was developed. Fluid resuscitation followed the Parkland formula. Meals were provided from both hospital and home sources, supplemented with high-protein oral feeds, zinc (15 mg), and vitamin C (500 mg). Caregiver involvement and nursing support were integrated into the feeding process. **Key Results:** The individualised nutrition plan, supported by interdisciplinary collaboration and caregiver education, contributed to achieving target nutritional intake and clinical improvements. The patient showed gradual recovery with stabilised albumin levels, improved wound healing, and reduced complications. **Conclusion:** In resource-limited settings, effective burn nutrition therapy is feasible using locally available foods, targeted supplementation, and multidisciplinary coordination. Early assessment, tailored interventions, caregiver engagement, and regular monitoring are critical to successful burn recovery outcomes.

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INTRODUCTION

Burn injuries are among the most devastating forms of trauma, leading to a profound hypermetabolic and catabolic response that begins within hours of injury and can persist for weeks or months (Chourdakis et al., 2020; Rousseau et al., 2013). This response dramatically increases the body's energy and protein demands, leading to significant loss of lean body mass, impaired immune function, delayed wound healing, and increased risk of complications or mortality if not properly addressed. Nutritional therapy plays a pivotal role in mitigating these effects, with emphasis on meeting macronutrient and micronutrient requirements, minimising protein-energy deficits, and incorporating targeted supplementation (Laviano et al., 2017). While the clinical importance of nutrition in burn care is well-established in high-resource settings, there is limited evidence on how these standards can be adapted and implemented in resource-constrained environments, particularly in Sub-Saharan Africa. Many hospitals in low-resource settings lack access to advanced nutritional products, specialised feeding equipment, or clinical dietitians, posing significant challenges to delivering optimal nutritional care for burn patients. This case report addresses this gap by exploring the question: How can individualised nutritional care for a patient with extensive burns be effectively implemented in a low-resource intensive care unit (ICU)? The purpose of this study is to document and evaluate the practical application of burn nutrition guidelines using locally available resources, within the constraints of a tertiary hospital in Tanzania.

Using a case study design, we observed and documented the nutritional assessment, planning, implementation, and monitoring of a 30-year-old male patient with 53% total body surface area (TBSA) second-degree burns. Nutritional requirements were calculated using established clinical formulas, including the Curreri and Parkland formulas, and interventions were adapted to utilise hospital meals, home-prepared foods, and affordable supplementation. The care process was coordinated through collaboration among clinicians, nurses, caregivers, and nutrition professionals.

We hypothesised that, even in a low-resource ICU setting, a tailored nutritional intervention plan based on clinical guidelines, supported by caregiver education and multidisciplinary teamwork, would contribute to improved nutritional intake, wound healing, and overall patient recovery. This case report aims to contribute practical insights to the growing body of knowledge on burn care nutrition in resource-limited environments.

METHODOLOGY

This study employed an exploratory case study design, focusing on a single patient with extensive burn injuries to investigate the feasibility and effectiveness of individualised nutritional care in a low-resource ICU setting. The choice of a single case was intentional, given the study's aim to provide in-depth insight into nutritional management practices in a context where resources, clinical personnel, and specialised nutritional products are limited. A larger sample size was not feasible due to time constraints, the

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specificity of the case, and the ethical need to ensure that patient care was not compromised during data collection. Additionally, severely burned patients with similar profiles were not frequently admitted during the study period, making a broader sample impractical for this initial investigation.

Data collection was rigorous and systematic, involving multiple sources to ensure triangulation and reliability. These included: Patient clinical records (laboratory data, fluid balance charts, nursing notes), Direct observation of feeding practices, wound care, and caregiver involvement, Dietary intake records documented during the intervention period, Nutrition-focused physical assessments conducted by the clinical nutritionist, caregiver and nurse interviews to assess adherence and feeding challenges.

Data Analysis, Quantitative data (anthropometric, biochemical, and dietary intake values) were analysed using descriptive statistics, including means and percentages, to track changes over time. Qualitative data (observations and interviews) were analysed using thematic content analysis to identify recurring patterns related to feeding challenges, caregiver engagement, and intervention acceptability. This methodology ensured that the case was not only clinically informative but also contributed to practice-based evidence for managing burn injuries in resource-limited settings.

Case Presentation: A 30-year-old male patient with second-degree burns involving the trunk, back, both forearms, lower limbs, and buttocks, covering 53% of the total body surface area (TBSA), was admitted to the Surgical Intensive Care Unit (SICU) at Muhimbili National Hospital-Mloganzila. He was transferred in from the Emergency Department after being referred from Mlandizi Hospital following a burn injury sustained while attempting to extinguish a fire resulting from a motor traffic accident (MTA). Upon admission, his clinical condition included severe pain, full consciousness, significant fluid imbalances, and an increased risk of infection due to the extensive burn areas, which were classified as superficial, partial-thickness, and full-thickness burns.

The Initial Nutritional Assessment included Anthropometry measurements such as weight (estimated): 65 kg, Height: 164 cm BMI: 24.17kg. Laboratory Findings: WBC 14.9, Hb 15, PLT 104, BUN 3.7, CRE 76.7, K 3.5, Na 148, Ca 1.89, Mg 0.77, RBG 6.6, albumin 18. Nutrition- Focused physical examination: Generalised swelling/edema, not pale, conscious, and 53% TBSA burn wound. Food and nutrition-related history: The patient was on a regular diet, and he was able to consume food orally but had limited arm movement due to a burn injury. Nutrition diagnosis. Table 1 below illustrates the nutrition diagnosis supported by the findings of the nutrition assessment.

RESULTS

Table 1: Illustrates the Identified Nutrition Diagnosis (ND)

INTAKE DOMAIN	**Problem (P)**	**Etiology (E)…***related to…*	**Signs/Symptoms (S)…***as evidenced by…*
Nutrition Diagnosis (ND-1)	Hyper metabolism	Catabolic illness, infection	Fever, BP 150/90 burn wound CRP 137
Nutrition Diagnosis (ND-2)	Increased Nutrient Needs	Wound healing	Fever, K 3.5, Ca 1.89, burns wound
Nutrition Diagnosis (ND-3)	Evident protein deficiency	Burn, inflammation	Low albumin level 18, CRP 137, open skin
BEHAVIORAL-ENVIRONMENTAL DOMAIN			

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INTAKE DOMAIN	Problem (P)	Etiology (E)…*related to…*	Signs/Symptoms (S)…*as evidenced by…*
Nutrition Diagnosis (ND-4)	Food and nutrition-related knowledge deficit	Lack of prior exposure to nutrition recommendations for burn patients	Patients and caretaker, Food and nutrition-related history/information
Nutrition Diagnosis (ND-5)	Self-feeding difficult	Inability to grasp cups and utensils for self-feeding. Inability to support and/ or control the neck. Lack of coordination of hand to mouth.	Limited physical ability stretches due to burn injury.

Nutritional Intervention

In resource-limited Intensive Care Unit (ICU) settings, the study adopted a systematic approach to nutrition and fluid management to effectively meet patients' metabolic demands. Energy requirements were calculated using the Curreri formula, which estimated daily caloric needs as (25×body weight in kg) +(40×TBSA burned). For a 65 kg patient with 53% total body surface area (TBSA) burns, the caloric need was 3,773 kcal/day. Protein requirements were determined as 1g × body weight in kg × 3 × TBSA, resulting in a daily intake of 226 g. Carbohydrates 55–60% of total energy to carbohydrates, calculated at 566 g/day, and 15–20% to fats, estimated at 67 g/day. Fluid management was guided by the Parkland formula for initial resuscitation, with 13,780 mL administered within the first 24 hours, half of which was delivered in the first 8 hours. Maintenance fluids were subsequently calculated at 30 mL/kg/day.

The diet plan was designed to meet the Recommended Dietary Allowances (RDA) and included foods rich in omega-3 fatty acids, vitamin C, zinc, selenium, and high biological value proteins. Patients were provided with three main meals and two snacks daily, which consisted, milk, chicken, meat, eggs, ugali, rice, cooked banana, vegetables and fruits, with meals progressively adjusted to meet 80–100% of calculated energy and protein needs. Oral feeding consisted of high-energy, high-protein diets administered 4–6 times per day, with portion sizes of 300–500 mL every 3–4 hours. Nurses assisted in feeding to ensure nutrient goals were achieved. High-protein oral nutritional supplements were introduced, delivering 188 kcal, 5 g carbohydrates, 37.5 g protein, 2 g fat, glutamine (0.05 g), and zinc (3.126 mg) per day. Additionally, vitamin C (500 mg) and zinc (15 mg) were supplemented daily to support wound healing.

Strict fluid resuscitation protocols were followed to address fluid loss and maintain hemodynamic stability. Electrolytes, including potassium, sodium, calcium, and magnesium, were closely monitored and replenished as needed. Caregiver education was integral to the intervention, focusing on nutrient-dense food preparation, portion control, and feeding schedules. Caregivers were provided with a 3–5-day meal plan, which was revised periodically to align with patient needs and preferences. This evidence-based approach ensured that nutritional and hydration goals were met, supporting recovery and minimising complications in patients with limited ICU resources.

Monitoring and Evaluation (follow-up)

Blood urea nitrogen (BUN), albumin, and electrolyte levels was assessed weekly; body weight was monitored monthly. Intake and output were recorded for 24 hours. Wound healing, nutritional plans, and refeeding syndrome were also monitored daily. Patients stayed in the surgical Intensive Care Unit (ICU) for 115 days; daily monitoring was done, where nutrition

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requirements were adjusted according to the situation. After 90 days in the Intensive Care Unit (ICU) and two skin grafting procedures, the researchers encountered other nutrition diagnoses, such as:

Table 2: Late Identified Nutrition Diagnosis

CLINICAL DOMAIN	**Problem (P)**	**Etiology (E)…***related to…*	**Signs/Symptoms (E) …***as evidenced by…*
Nutrition Diagnosis (ND-6)	Involuntary weight loss	Increased nutrients need Prolonged hospitalization Psychological issues Physiologic causes	Poor intake following Surgery, i.e. starvation before, during, and after skin grafting procedures. Bwt~60kg
BEHAVIORAL-ENVIRONMENTAL DOMAIN			
ND-7	Undesirable food choices	Denial of the need for food and nutrition-related changes	Irritability and depression Consumption of high-sugar processed juice.

Following the delayed nutrition diagnosis (ND), nutrition interventions included counselling for both the patient and family, emphasising the importance of nutrition in tissue repair, wound healing, and overall recovery in burn patients. Referrals were made for psychological support to address the emotional and mental health needs of the patient. After 115 days in the Intensive Care Unit (ICU), the patient was transferred to the ward to continue treatment. Following 25 days in the ward, the patient was discharged home with instructions to continue a high-protein diet to support body maintenance and promote recovery. The nutrition assessments were conducted, including anthropometric measurements: body weight of 63kg, height of 164cm BMI of 23.4kg/m^2. Clinically, the patient was stable, and the last biochemical tests were around normal ranges: Na 138, K 3.9, Ca 2.28, Mg 2.88, Cl 103, Albumin 36, Hb 13, BUN 3.9, WCB 6.77, Platelets 429, AST 31, ALT 28.

DISCUSSION

Severe burn injuries elicit a significant hypermetabolic and hypercatabolic response that leads to rapid consumption of protein and energy reserves. Patients with severe burn injuries, like the patient in this case with a large TBSA, require comprehensive nutritional therapy to optimise recovery. Nutritional support is very critical in patients with burns, as it directly affects the healing of wounds, immune function, and general wellbeing (Chourdakis et al., 2020; Rousseau et al., 2013). However, in low-resource settings where specialised products are scarce, this poses a challenge to delivering adequate nutritional demands. Utilising locally available resources and prioritising energy-dense and protein-rich options effectively addressed the hypermetabolic state. The patient was taking 2 meals from the hospital kitchen with an approximate quantity of 300-500 milliliters, and 3 meals from home with the same quantity, a well-diversified diet as well as high protein nutrition supplements of 50g once per day; to make sure the patient meets the body's nutrients demands; for example, the nutrient distribution from these meals were energy 3395kcals, carbohydrates 686g, proteins 221g and fat 777g to make sure the patient meets the body's nutrients demands. See figure 1 below. The hospital and home meals in combination with nutritional supplements provided >90% of the macronutrient requirements, while the micronutrient requirements were provided mostly below 50% but zinc 90% and selenium 755 of the body's need. See Table 3.

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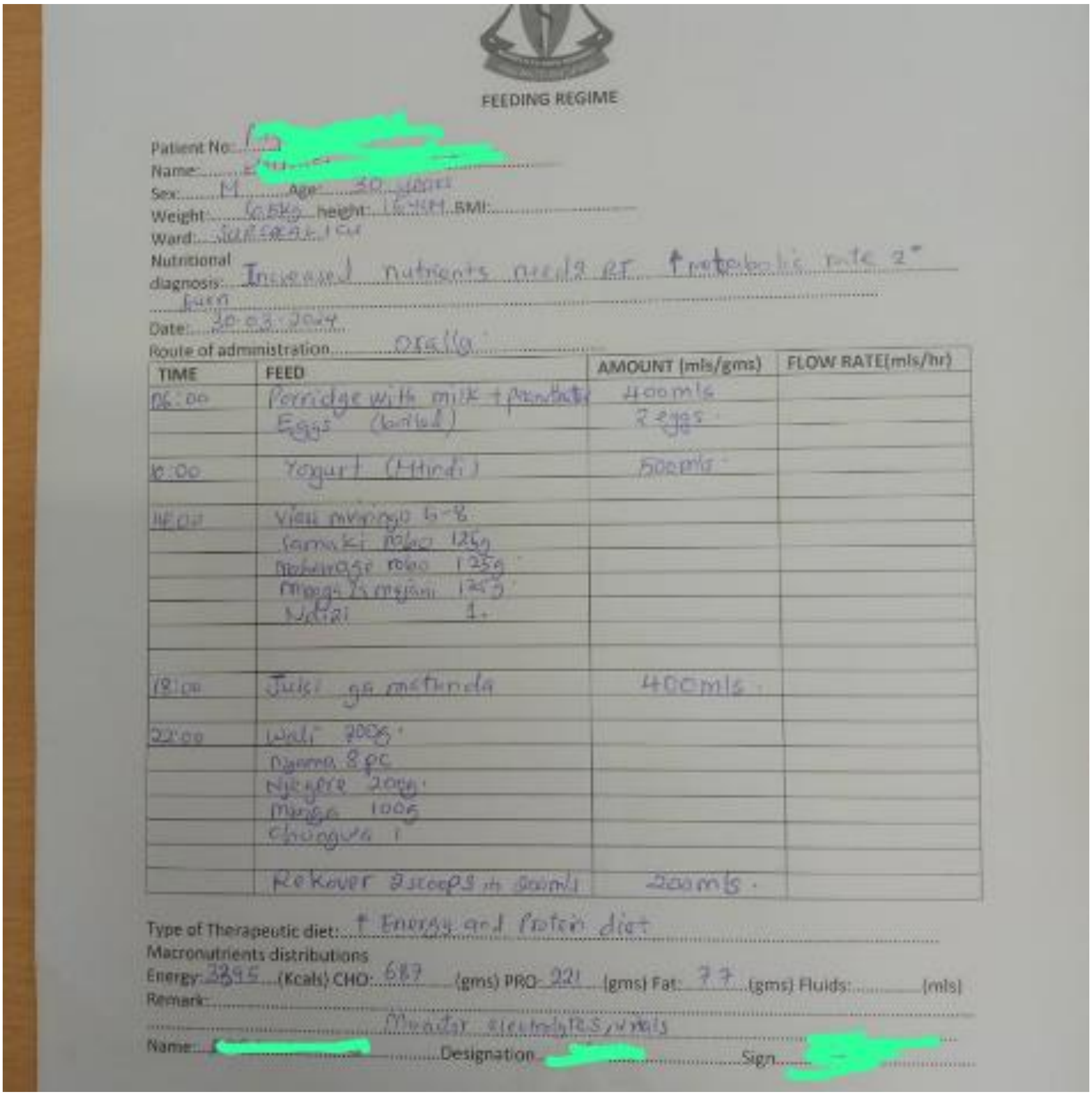
Figure 1: Bedsite Feeding Regime



FEEDING REGIME

Patient No:
Name:
Sex: M Age: 30 years
Weight: 65kg height: BMI:
Ward: Surgical ICU
Nutritional diagnosis: Increased nutrients needs RT ↑ metabolic rate 2° burn
Date: 30-03-2024
Route of administration: orally

TIME	FEED	AMOUNT (mls/gms)	FLOW RATE(mls/hr)
06:00	Porridge with milk + [illegible]	400mls	
	Eggs (boiled)	2 eggs	
10:00	Yogurt (Hindi)	500mls	
14:00	[illegible]		
18:00	Juici ya matunda	400mls	
22:00	Wali 200g		
	Rekover 2scoops in 200mls	200mls	

Type of Therapeutic diet: ↑ Energy and Protein diet
Macronutrients distributions
Energy: 3395 (Kcals) CHO: 687 (gms) PRO: 221 (gms) Fat: 77 (gms) Fluids: (mls)
Remark: Monitor electrolytes, vitals
Name: Designation: Sign:

Table 3: Sample of Nutrient Distribution from a Day Diet Intake (24hrs)

Nutrients	RDA target	Provided	Percent %
Energy	3773kcals	3395kcals	90%
Proteins	226g	221g	98%
CHO	566g	686g	121%
Fat	67g	77g	114%
Fluids	13780mls	Oral fluids -1500mls +IV-8100mls	70%
Vitamin C	1000mg	27mg-diet+ 500mg-supplement	53%
Glutamine	33g	5g	15%
Zinc	30mg	12mg- + 15mg supplement	90%
Selenium	200µg	150 µg	75%
Omega 3	4g	2g	50%

Medical Nutrition Therapy (MNT) is a cornerstone in the comprehensive management of burn injuries, as it plays a vital role in enhancing wound healing, preserving lean body mass, and reducing infection-related morbidity and length of hospital stay (Laviano et al., 2017; Rousseau et

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al., 2013). In burn patients, the metabolic rate can increase by 1.5 to 2 times the normal rate, and protein catabolism significantly accelerates due to the systemic inflammatory response. These physiological changes necessitate a high-protein, high-energy diet and often the use of adjunct therapies like albumin infusions, as was employed in this case (20 mg TDS), to correct hypoalbuminemia and maintain oncotic pressure during the acute phase of injury.

This case report aligns with prior studies that underscore the importance of individualised nutrition plans and interdisciplinary care in improving outcomes for burn patients, even in resource-limited settings. The use of established guidelines such as the Curreri and Parkland formulas to calculate energy and fluid requirements, and the integration of locally available foods with targeted supplementation (zinc, vitamin C, high-protein oral feeds), reflects a practical and adaptable approach to burn nutrition therapy in low-income environments.

Despite the tailored nutrition intervention, several clinical and behavioural factors influenced dietary adherence. These included anorexia, psychological denial, febrile episodes, and scheduled surgical procedures that required the patient to remain nil per oral (NPO) preoperatively. These findings are consistent with the literature, indicating that burn patients often face appetite suppression and gastrointestinal discomfort due to both physiological stress and treatment-related limitations (Rousseau et al., 2013). Such disruptions were linked to periods of suboptimal nutritional intake in this case, resulting in weight loss, delays in surgical interventions like skin grafting, and an extended hospital stay.

Importantly, the involvement of caregivers and nursing staff in monitoring food intake and assisting with feeding was crucial to mitigating some of these challenges. While the patient's adherence was intermittent, the overall commitment of the care team and family contributed to a gradual but significant clinical improvement, reinforcing the idea that a multidisciplinary and family-centred approach is vital for nutritional success in burn rehabilitation.

Furthermore, because of worries about microbial contamination and variations in nutrient composition, worldwide clinical nutrition recommendations frequently oppose the use of unstandardized local foods in critical care settings, including the intensive care unit (Ojo et al., 2020). Rather, they support commercially manufactured, pre-packaged enteral nutrition formulas because they guarantee microbiological safety, accurate nutritional administration, and simplicity in recording and monitoring (KeMoH, 2010, 2020). According to American Society of Parenteral and Enteral Nutrition (ASPEN) and European Society of Parenteral and Enteral Nutrition (ESPEN) guidelines, enteral nutrition (EN) is the preferred feeding route for burn patients due to its numerous advantages over parenteral nutrition (PN). Early initiation of EN is particularly beneficial, as it is associated with reduced infection rates, lower costs, shorter hospital stays, a decreased hypermetabolic phase, preservation of gastrointestinal tract integrity, and improved nutrient adequacy (Chourdakis et al., 2020). Certain important nutrient supplements are vital for regulating inflammation, bolstering the immune system, and accelerating wound healing in the nutritional management of burn injuries.

By reducing the hyper-inflammatory response, maintaining intestinal integrity, and boosting immunological competence, essential nutrients like glutamine, selenium, and omega-3 fatty acids have been demonstrated to enhance clinical outcomes in burn patients. Unfortunately, due to restricted availability, these supplements were not supplied in this instance. But zinc and vitamin C, which are essential for collagen formation, antioxidant protection, and immunological support, were given. In the nutritional therapy of burn injuries, a few key nutrient supplements are essential for controlling inflammation, strengthening the immune system, and hastening wound healing. Essential nutrients such as glutamine, selenium, and omega-3 fatty acids have been shown to improve clinical outcomes in burn patients by lowering the hyperinflammatory

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response, preserving intestinal integrity, and increasing immunological competence. Regretfully, these supplements were not provided in this case due to limited availability.

However, vitamin C and zinc, which are necessary for the production of collagen, antioxidant defence, and immunological support, were provided. There are still large gaps in nutritional care in burn units in spite of these beneficial approaches. Additionally, Mutua et al. discovered that only 9% of patients received micronutrient supplements and that many patients were admitted without customised nutrition prescriptions, suggesting a poor integration of evidence-based nutrition treatment into clinical procedures. In order to enhance outcomes for burn patients, these gaps highlight the necessity of fortifying nutrition programs, guaranteeing early evaluation by clinical nutritionists, and facilitating access to essential micronutrients and functional nutrients (Mutua et al., 2009). In order to provide tailored and comprehensive patient care, effective burn care significantly depends on a multidisciplinary approach that integrates the knowledge of clinical nutritionists, doctors, surgeons, social welfare officers, mental health specialists, physiotherapists, and nursing personnel.

In the end, this collaborative paradigm improves recovery outcomes and care quality by ensuring that the patient's physiological and psychosocial needs are met. The importance of clinical nutrition in burn care was highlighted by case report research at Pinderfield General Hospital in the UK, which found that 70% of bedside clinical reviews led to dietetic interventions. This emphasises how crucial nutrition evaluation and prompt action are to the treatment of complicated burn victims. According to nutritional support standards, a normal adult burn patient weighing 75 kg should consume about 2000 kcal per day, including 110 grams of protein per day. Protein is necessary for immune system function, tissue repair, and maintaining lean body mass. Furthermore, it is advised to take 30–40 grams of glutamine daily to assist wound healing, immunological modulation, and gut integrity, especially during the hypermetabolic phase that follows burn injury. Regular weight checks and biochemical monitoring (such as albumin, prealbumin, electrolytes, and renal function), food and nutrition-related history and nutrition-focused physical examination are essential for determining whether nutrition support is adequate. In this instance, the monitoring's frequency and content were mostly in line with worldwide practice recommendations, which helped to improve patient outcomes and make well-informed treatment adjustments (Windle, 2008).

Limitations

This study is limited by its single-case design, which restricts generalizability. However, as an exploratory case report, it offers valuable insights into the feasibility and adaptability of nutrition protocols in low-resource settings. Another limitation was the inconsistent dietary monitoring due to shifts in caregiver presence and the high workload of ICU staff, which may have affected the precision of dietary intake assessments.

Additionally, the study did not include long-term follow-up data post-discharge to evaluate sustained recovery or nutritional status. Psychological factors, although noted, were not assessed with standardised tools, which limits a deeper understanding of their impact on dietary adherence.

This case supports existing evidence that early and sustained nutritional intervention is critical for burn recovery. It also highlights a significant gap in the literature regarding how low-resource ICUs can implement evidence-based nutritional strategies using available food sources, basic supplementation, and strong caregiver engagement. Future studies involving larger samples, more robust monitoring tools, and long-term follow-up are warranted to establish scalable protocols for burn nutrition therapy in similar contexts.

CONCLUSION

Optimising nutritional interventions in the management of severe burns requires a

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comprehensive understanding of nutritional science, regular monitoring, and consistent application of the Nutrition Care Process (NCP). This case highlights that even in resource-limited settings, early and individualised nutrition therapy can significantly improve clinical outcomes by enhancing wound healing, preserving lean body mass, reducing complications, and shortening hospital stays. The integration of tailored dietary care into multidisciplinary burn management is essential for promoting complete recovery and improving patients' quality of life. Future research should focus on multi-case or cohort studies to enhance generalizability, cost-effectiveness analyses of locally adapted nutrition plans, long-term follow-up on post-discharge outcomes, and the role of psychosocial factors in dietary adherence. Additionally, there is a need to explore technology-assisted monitoring tools and evaluate the impact of caregiver and healthcare provider training on effective implementation of burn nutrition protocols in low-resource settings.

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