SJIF Impact Factor: 6.711

WORLD JOURNAL OF ADVANCE HEALTHCARE RESEARCH

ISSN: 2457-0400
Volume: 8.
Issue: 11
Page N. 194-200
Year: 2024

Original Article www.wjahr.com

EVALUATION OF MALNUTRITION IN BURNS

Ethar Ibrahim Jasim Almahdi[1]* and Mohammed Sattar Maaroof

[1]AL-Najaf Health Directorate, Al-Najaf, Iraq.
[2]Head of Burn ICU, Burn Hospital / Medical city of Baghdad, Baghdad, Iraq.

Article Received date: 05 September 2024 **Article Revised date:** 25 September 2024 **Article Accepted date:** 15 October 2024

***Corresponding Author: Ethar Ibrahim Jasim Almahdi**
AL-Najaf Health Directorate, Al-Najaf, Iraq.

ABSTRACT

Background: Malnutrition is a critical and often under recognized complication in burn patients, playing a significant role in influencing both short- and long-term outcomes. This study examines burn patients' malnutrition from admission to 1 week later. **Method:** A prospective study was conducted on Al-Najaf Burn Centre patients having at least 10% TBSA burns. TBSA, comorbidities, and demographics were assessed for 40 individuals. **Results:** The results show a significant increase in malnutrition risk, with MUST scores rising from 0.30 at admission to 1.03 after 7 days, and BMI decreasing from 24.6 to 23.2 during the same period. Patients with greater body weight loss and lower BMI were at higher risk of malnutrition. No significant relationship was found between burn surface area (BSA) and malnutrition risk. However, body weight loss was strongly associated with worsening nutritional status. **Conclusion:** This study highlights the dietary challenges burn patients face, with malnutrition risk rising in the first week after hospitalization. Patients with a lower baseline BMI and more body weight loss are more likely to deteriorate nutritionally, as seen by a significant BMI decline and an increase in MUST scores within seven days of admission. Malnutrition risk was not associated with burn surface area (BSA). We found a strong link between malnutrition risk and body weight decrease. These findings emphasize the need for early and vigorous dietary therapy in burn patients to enhance recovery and prevent malnutrition.

KEYWORDS: Malnutrition, MUST, BSA, Burns.

INTRODUCTION

Malnutrition is a critical and often underrecognized complication in burn patients, playing a significant role in influencing both short- and long-term outcomes. Burn injuries induce a profound physiological response that includes hypermetabolism, catabolism, and inflammatory reactions, all of which significantly impact the nutritional status of the patient. Following a severe burn, the body's metabolic demands can increase by as much as 200%, leading to rapid depletion of essential nutrients and muscle mass if not adequately addressed. This state of hypermetabolism, combined with altered protein synthesis and degradation, creates a unique challenge in managing nutrition for burn patients, necessitating specialised evaluation and intervention strategies to mitigate the adverse effects of malnutrition.[1,2] The evaluation of malnutrition in burn patients is particularly important because nutritional status plays a key role in wound healing, immune function, and overall recovery. Burn wounds demand a high rate of protein and calorie consumption for tissue repair and immune defence, while the catabolic state associated with burns accelerates the breakdown of lean body mass. Malnutrition in these patients can delay wound healing, increase susceptibility to infections, and prolong hospital stays, leading to higher morbidity and mortality rates. Studies have shown that patients with severe burns are at a high risk of developing protein-energy malnutrition (PEM), characterised by a significant loss of body weight, muscle wasting, and deficiencies in vitamins and minerals essential for the healing process.[3,4] Nutritional assessment in burn patients typically involves a combination of clinical evaluation, laboratory markers, and indirect calorimetry to determine the patient's metabolic needs. Common methods include assessing weight loss, measuring serum proteins such as albumin and prealbumin, and evaluating nitrogen balance to monitor protein catabolism. However, traditional markers of malnutrition can be misleading in burn patients due to the acute inflammatory response, making a comprehensive approach essential for accurate evaluation. In addition to the metabolic demands of wound healing, the severity and size of the burn, infection, and the patient's pre-existing nutritional status also influence nutritional requirements.[5,6] Early and aggressive nutritional support is vital in burn care, and a

multidisciplinary approach is often employed to manage malnutrition. This includes ensuring adequate caloric intake, with a particular emphasis on protein, to meet the heightened metabolic demands and support tissue repair. The early initiation of enteral nutrition, where feasible, has been shown to reduce the risk of infections and improve patient outcomes. Ongoing nutritional monitoring and adjustment are crucial throughout the patient's recovery to prevent malnutrition and optimise healing in the context of burn injuries.[7,8] The aim of study is to evaluate the rate of malnutrition in burn patients from the time of admission and 1 week after admission.

METHOD

prospective study involved the collection of prospective data on burn patients with at least 10% total body surface area (TBSA) burns, admitted to Al-Najaf Burn Center. Demographic information, TBSA, and comorbidities were recorded and evaluated for a total of 40 patients. **Demographic and Clinical Data**: Patients' demographic information (age, gender, occupation, education level, and marital status) and clinical characteristics (medical history and burn features) were documented. These variables included the type of burn (e.g., gas, benzene, electrical, chemical), the extent of burns measured by BSA, and the degree of burns (first, second, third, or fourth degree). The cause of burns (accidental, suicidal, or homicidal) was also recorded. **Nutritional Assessment**: The nutritional status of the patients was assessed using the Malnutrition Universal Screening Tool (MUST). The first MUST assessment was performed within 24-48 hours of admission, and a second assessment was conducted 7 days after admission to evaluate changes in nutritional status over time.[9] MUST is a five steps screening tool to identify adult who are malnourished or at risk of malnutrition, it also includes management guidelines which can be used to develop care. **Body Mass Index (BMI) Measurements**: BMI was recorded at two time points: within 24 hours of admission and after 7 days. This was used to monitor weight changes and assess the patients' nutritional status over the course of their hospitalization.[9] **Data Collection and Analysis**: Data were collected on the percentage of burn surface area (BSA) affected, the percentage of body weight loss, and the BMI. The association between these factors and malnutrition risk was assessed using the MUST tool. Changes in BMI and MUST scores from admission to 7 days' post-admission were analyzed to determine the impact of burns on nutritional status. **Statistical Analysis**: A multivariable regression model was used to explore the relationship between BSA, weight loss, BMI, and malnutrition risk (as determined by the MUST scores). Descriptive statistics such as frequencies and percentages were calculated for categorical variables (e.g., age groups, gender, occupation, etc.), and paired t-tests were performed to assess the statistical significance of changes in BMI and MUST scores over time. A p-value of less than 0.05 was considered statistically significant.

RESULTS

Table 1 provides an overview of 40 burn patients, focusing on demographics and medical history. The majority (62.5%) were aged 18-30, with a near-equal gender distribution (52.5% female, 47.5% male). Most patients were housewives (30%), followed by self-employed individuals and students. In terms of education, 45% had secondary education, and 65% were married. Only 15% had a medical history, with diabetes being the most common condition (7.5%). Overall, the patients were mostly young, with minimal comorbidities, which could influence their recovery from burn injuries.

Table 1: Distribution of patients according to study variables.

Variables		Frequency	Percentage
Age groups (years)	***18-30***	25	62.5
	31-40	8	20.0
	41-50	4	10.0
	51-60	3	7.5
Gender	***Female***	21	52.5
	male	19	47.5
Occupation	***student***	10	25.0
	self	11	27.5
	government	7	17.5
	housewife	12	30.0
Education	***literate***	4	10.0
	primary	8	20.0
	secondary	18	45.0
	high	10	25.0
Marital state	***Married***	26	65.0
	Unmarried	14	35.0
Medical history	***asthma***	2	5.0
	DM	3	7.5
	epilepsy	1	2.5
	no	34	85.0

Table 2 outlines the characteristics of burn injuries among the 40 patients, focusing on burn type, burn surface area (BSA), burn degree, and cause of the burn. **Type of Burn**: The most common cause of burns was gas-related incidents (47.5%), followed by burns caused by benzene (30%), electrical burns (12.5%), and chemical burns (10%). **Burn Surface Area (BSA)**: The majority of patients (65%) had burns covering 26-50% of their body surface area, while 25% had burns covering 0-25% of their body, and 10% had burns covering 51-75%. **Degree of Burn**: Most patients had third-degree burns (60%), followed by second-degree burns (35%), while first- and fourth-degree burns were rare (2.5% each). **Reason for Burn**: Accidents were the primary cause of burns, accounting for 90% of cases, with suicidal and homicidal causes each contributing 5%.

Table 2: Distribution of patients according to burn features.

Variables		Frequency	Percentage
Types of burn	***benzene***	12	30.0
	gas	19	47.5
	electrical	5	12.5
	chemical	4	10.0
BSA	***0-25***	10	25.0
	26-50	26	65.0
	51-75	4	10.0
Degree of burn	***1.00***	1	2.5
	2.00	14	35.0
	3.00	24	60.0
	4.00	1	2.5
Reason of burn	***accident***	36	90.0
	suicidal	2	5.0
	homicidal	2	5.0

Table 3 presents the results of the Malnutrition Universal Screening Tool (MUST) assessment, conducted at two points: within 24 hours of admission and 7 days later. **MUST at 24 Hours**: The majority of patients (77.5%) were classified as low risk for malnutrition, while 15% were at medium risk, and 7.5% were at high risk. **MUST After 7 Days**: After one week, the proportion of patients at low risk for malnutrition decreased to 42.5%, while the medium risk group increased to 30%, and the high-risk group grew significantly to 27.5%. In summary, the results show a noticeable deterioration in nutritional status over the first week after admission, with more patients moving from low to medium and high malnutrition risk categories.

Table 3: MUST screening tool of malnutrition at 24 hours of admission to burned ward and 7 days after admission.

variables		MUST before		MUST After	
		frequency	percentage	frequency	percentage
Degree of MUST	low	31	77.5	17	42.5
	Medium	6	15.0	12	30.0
	High	3	7.5	11	27.5

Table 4 details the changes in Body Mass Index (BMI) for the patients at two time points: within 24 hours of admission and 7 days later. **BMI at 24 Hours**: Most patients (77.5%) had a BMI greater than 20, with 15% having a BMI between 18.5 and 20, and only 7.5% with a BMI below 18.5, indicating underweight status. **BMI After 7 Days**: After 7 days, the proportion of patients with a BMI greater than 20 decreased slightly to 75%. Those with a BMI below 18.5 increased to 17.5%, showing a rise in underweight individuals, while the 18.5-20 group decreased to 7.5%. In summary, the data indicates a decline in BMI over the first week, with more patients falling into the underweight category, reflecting the impact of burn-related hypermetabolism and inadequate nutritional intake.

Table 4: BMI at 24 hours of admission to burned ward and 7 days after admission.

variables		BMI before		BMI After	
		frequency	percentage	frequency	percentage
BMI	<18.5	3	7.5	7	17.5
	18.5-20	6	15.0	3	7.5
	>20	31	77.5	30	75.0

As in fig 1; 47.5% of patient's have less than 5 percentage of decrease in body weight, 45% of patient's have 5-10 percentage of decrease in body weight and only 7.5% of patient's have more than 10 percentage of decrease in body weight.

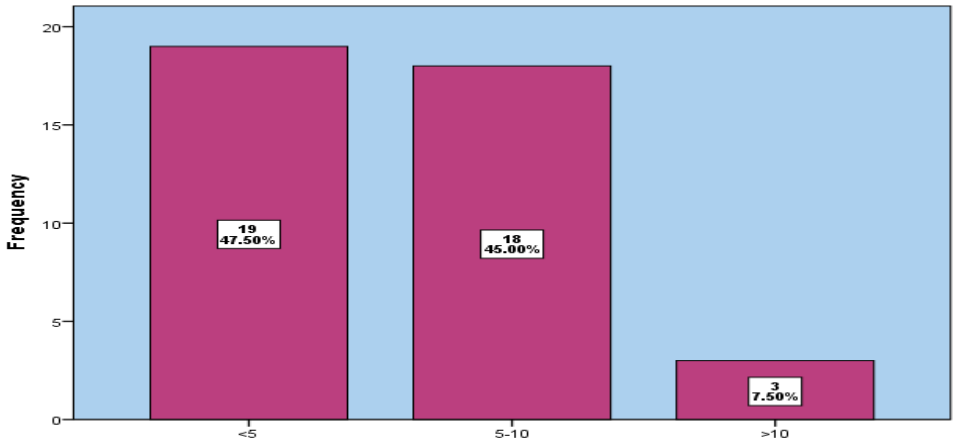

Fig. 1: Distribution of patient according to percentage of decrease in body weight.

Table 5 compares the mean MUST (Malnutrition Universal Screening Tool) scores of patients at two points: within 24 hours of admission and 7 days later. **MUST Before Admission**: The mean MUST score within 24 hours of admission was 0.30, with a standard deviation of 0.3. **MUST After 7 Days**: After one week, the mean MUST score increased to 1.03, with a standard deviation of 0.37. **P-value**: The p-value was reported as 0.0001, indicating a statistically significant increase in the MUST scores after 7 days, which suggests a worsening of the patients' nutritional status during the first week of admission. The MUST scores significantly increased after one week, indicating that patients' risk of malnutrition worsened during the early days of their hospital stay.

Table 5: Difference of MUST means before and after.

	N	Mean	Std. Deviation	P-value
MUST before	40	0.30	0.3	**0.0001**
MUST after	40	1.03	0.37	

Table 6 presents the mean Body Mass Index (BMI) of patients at two points: within 24 hours of admission and 7 days later. **BMI Before Admission**: The mean BMI within 24 hours of admission was 24.6, with a standard deviation of 4.5. **BMI After 7 Days**: After one week, the mean BMI dropped to 23.2, with a standard deviation of 4.6. **P-value**: The p-value was reported as 0.0001, showing a statistically significant decrease in BMI after 7 days. There was a significant decline in BMI during the first week of admission, reflecting the effects of hypermetabolism and inadequate nutrition in burn patients, potentially leading to malnutrition if not properly managed.

Table 6: Difference of BMI means before and after.

	N	Mean	Std. Deviation	P-value
BMI before	40	24.6	4.5	**0.0001**
BMI after	40	23.2	4.6	

MUST score =0 (low risk of malnutrition): Patients with 0-25% BSA had a relatively low prevalence of malnutrition (29.4%), while those with 26-50% BSA showed the highest percentage (58.8%). For 51-75% BSA, only 11.8% fell into this category. The majority of patients with less than 5% weight loss were in the low-risk MUST group (94.1%). Patients with a BMI >20 were all in the low MUST category (100%).

MUST score = 1 (medium risk of malnutrition): For 0-25% BSA, 16.7% of patients were categorized as medium risk, and for 26-50% BSA, this increased to 66.7%, while 51-75% BSA patients had a 16.7% medium MUST risk. The 5-10% weight loss category was most commonly associated with medium risk (91.7%). In terms of BMI, 91.7% of those with a BMI >20 were in the medium MUST category.

MUST score > or= 2 (high risk of malnutrition): In patients with 0-25% BSA, 27.3% were at high malnutrition risk. For 26-50% BSA, 72.7% of patients were classified as high risk, while none of the patients with 51-75% BSA were categorized as high risk. Patients with more than 10% weight loss had the highest risk,

with 27.3% falling into the high MUST category. Additionally, 54.5% of patients with 5-10% weight loss were classified as high risk. BMI <18.5 was strongly associated with high malnutrition risk, with 63.6% of patients in this group falling into the high MUST category.

The table 7 shows that there is no significant relationship between BSA and MUST screening results. However, a significant association exists between both the percentage of body weight loss and BMI with MUST scores, where higher weight loss and lower BMI are strongly linked to a higher risk of malnutrition after 7 days of admission.

Table 7: Association between result of Must screening result after 7 days of admission, BSA, percentage of decrease in body weight.

		Must screening			
		Low	**Medium**	**High**	**P-value**
BSA	***0-25***	5 (29.4%)	2 (16.7%)	3 (27.3%)	0.6
	26-50	10 (58.8%)	8 (66.7%)	8 (72.7%)	
	51-75	2 (11.8%)	2 (16.7%)	0 (0.0%)	
Percentages of decrease In body weight	***<5***	16 (94.1%)	1 (8.3%)	2 (18.2%)	**0.0001**
	5-10	1 (5.9%)	11 (91.7%)	6 (54.5%)	
	>10	0 (0.0%)	0 (0.0%)	3 (27.3%)	
BMI	***<18.5***	0 (0.0%)	0 (0.0%)	7 (63.6%)	**0.0001**
	18.5-20	0 (0.0%)	1 (8.3%)	2 (18.2%)	
	>20	17 (100.0%)	11 (91.7%)	2 (18.2%)	
Total		17 (100.0%)	12 (100.0%)	11 (100.0%)	

DISCUSSION

The MUST screening tool results demonstrate a clear trend toward deteriorating nutritional status in burn patients over the course of the first week. At 24 hours after admission, the majority of patients were classified as low risk for malnutrition. However, after 7 days, this figure dropped to 42.5%, with a corresponding increase in the proportion of patients at medium and high risk for malnutrition (30% and 27.5%, respectively). Several studies support these findings. For instance, **Dickerson et al.**[10] highlighted the rapid onset of malnutrition in burn patients due to the increased metabolic demands and catabolic response triggered by burn injuries. This aligns with the shift from low to higher malnutrition risk categories observed in the study. Similarly, **Williams et al.**[11] reported that malnutrition in burn patients often develops within the first week of admission due to insufficient caloric intake relative to increased energy requirements, resulting in a decline in nutritional status. Conversely, some studies disagree with this trajectory, suggesting that early aggressive nutritional support can mitigate these outcomes. **Demling and Seigne**[12] emphasize that patients who receive early enteral nutrition show improved outcomes and are less likely to experience the rapid deterioration in nutritional status indicated by rising MUST scores. According to their study, if patients receive prompt, aggressive nutritional intervention, their malnutrition risk does not necessarily escalate as severely as observed in this study. This discrepancy may suggest that the nutritional support provided in the current study was either delayed or inadequate to meet the patients' high metabolic demands.

The BMI data also indicates a decline in nutritional status, as evidenced by the increase in the proportion of patients with a BMI below 18.5 from 7.5% at admission to 17.5% after 7 days. At the same time, the percentage of patients with a BMI greater than 20 decreased slightly from 77.5% to 75%, reflecting the rapid loss of body mass in these patients. These results are consistent with studies showing that burn injuries often lead to significant reductions in body mass due to hypermetabolism. **Hart et al.**[13] demonstrated that burn patients commonly experience substantial weight loss within the first week of hospitalization, primarily due to increased protein catabolism. The findings in this study support that observation, with many patients becoming underweight (BMI <18.5) as their hospital stay progresses. On the other hand, some studies disagree with the extent of weight loss shown in this study. **Jeschke et al.**[14] argue that with proper early nutritional support—such as providing high-protein, high-calorie enteral feeds—weight loss can be minimized even in patients with severe burns. Their research indicates that proactive nutritional interventions can stabilize or even prevent the decline in BMI, especially in the critical early phases of care. The fact that BMI still decreased in this study suggests that patients may not have received optimal nutritional support, or that other factors, such as infection or complications, exacerbated weight loss.

The Malnutrition Universal Screening Tool (MUST) results show a statistically significant increase in malnutrition risk among burn patients during their first week of hospitalization. The mean MUST score at admission was 0.30, rising to 1.03 after seven days. This increase, with a p-value of 0.0001, indicates that patients' nutritional status deteriorated significantly over the course of the first week. This finding aligns with studies such as **Chourdakis M et al.** and **Williams et al.**, which highlight the hypermetabolic response in burn patients that rapidly depletes body reserves, leading to increased malnutrition risk. The rise in MUST scores reflects the body's need for more energy and nutrients to

support healing, while insufficient intake or nutritional support exacerbates the risk of malnutrition.[15,16] However, studies like **Jalkh APC et al.**[17] suggest that early, aggressive nutritional intervention can prevent or minimize this decline in nutritional status. These authors argue that malnutrition risk can be controlled if proper nutritional support, such as enteral feeding, is initiated immediately upon admission. The significant rise in MUST scores in this study suggests that the nutritional interventions provided may have been insufficient to meet the increased metabolic demands of the patients.

The Malnutrition Universal Screening Tool (MUST) results show a statistically significant increase in malnutrition risk among burn patients during their first week of hospitalization. The mean MUST score at admission was 0.30, rising to 1.03 after seven days. This increase, with a p-value of 0.0001, indicates that patients' nutritional status deteriorated significantly over the course of the first week. This finding aligns with studies such as **Serón-Arbeloa C et al.** and **Chao PC et al.**[18,19], which highlight the hypermetabolic response in burn patients that rapidly depletes body reserves, leading to increased malnutrition risk. The rise in MUST scores reflects the body's need for more energy and nutrients to support healing, while insufficient intake or nutritional support exacerbates the risk of malnutrition. However, study like Cook F et. al. suggest that early, aggressive nutritional intervention can prevent or minimize this decline in nutritional status. These authors argue that malnutrition risk can be controlled if proper nutritional support, such as enteral feeding, is initiated immediately upon admission. The significant rise in MUST scores in this study suggests that the nutritional interventions provided may have been insufficient to meet the increased metabolic demands of the patients.[20]

The Body Mass Index (BMI) results also show a significant decline over the first week of admission, with the mean BMI decreasing from 24.6 to 23.2 (p-value = 0.0001). This decline indicates that patients experienced substantial weight loss, which is characteristic of the hypermetabolic state induced by burn injuries. This weight loss is consistent with findings from **McCarthy D et al.**[21], who reported that burn patients often lose body mass rapidly due to increased protein catabolism and insufficient caloric intake. As the body breaks down muscle to meet its energy demands, the BMI decreases, reflecting the progressive undernourishment of the patients. However, Ma Y, **et al.**[22] found that this weight loss could be mitigated with adequate and timely nutritional support. Their research shows that with proper intervention, including high-protein, high-calorie diets, the decline in BMI can be controlled. The significant BMI drop observed in this study suggests that the patients may not have received optimal nutritional support or that other factors, such as infection or complications, further aggravated the catabolic response.

The results from Table 7 suggest that **there is no significant relationship between BSA and MUST screening results**. This is likely because BSA alone does not fully capture the complexity of a burn patient's nutritional status. However, **there is a significant relationship between weight loss, BMI, and MUST scores**. Higher weight loss and lower BMI are strongly associated with higher malnutrition risk after 7 days of admission. This finding is consistent with studies that highlight the critical role of body mass and weight changes in evaluating malnutrition, especially in hypermetabolic conditions like burn injuries. Several studies support the finding that **weight loss and BMI are more significant indicators of malnutrition than BSA** in burn patients. noted that the hypermetabolic state in burn patients leads to increased energy expenditure and muscle wasting, which are more directly reflected by changes in body weight and BMI than by the extent of burns (BSA). Similarly, emphasized the rapid catabolism of lean body mass in burn patients, which makes weight loss a critical factor in assessing nutritional deterioration.[23,24]

CONCLUSION

This study underscores the substantial nutritional obstacles that burn patients encounter, with the risk of malnutrition increasing significantly during the initial week of hospitalisation. Patients with a lower initial BMI and a higher body weight loss are more likely to experience a deterioration in nutritional status, as evidenced by a substantial decrease in BMI and an increase in MUST scores within seven days of admission. There was no significant association between burn surface area (BSA) and the risk of malnutrition. However, we observed a robust correlation between an elevated risk of malnutrition and a higher percentage of body weight loss. These findings highlight the importance of early and aggressive nutritional interventions in burn patients to aid recovery and prevent malnutrition. There was no significant association between burn surface area and risk of mal nutrition, we recommend conducting further research to study the impact of burn surface area on nutritional status for a period longer than one week.

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