



The Effect of an Exercise Program on the Quality of Life in Burn Patients

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Abstract

Background: Burn injuries are among the most significant causes of disability and death, having severe economic and social consequences in human societies.

Objectives: This study aims to examine the effect of an exercise program on the quality of life of burn patients admitted to the burn department of Ali Ibne Abi Talib Hospital in Zahedan.

Methods: In this quasi-experimental study, 30 patients with shoulder joint burns admitted to the burn department of Ali Ibne Abi Talib Hospital in Zahedan in 2021 participated. Patients meeting the inclusion criteria were selected via convenience sampling and then randomly assigned to intervention and control groups using permuted blocks. The intervention consisted of 4 individual training sessions and an exercise program. Patients in the intervention group performed exercises 3 times daily for 12 weeks, while those in the control group received only routine ward care. Data were collected using the Burn Specific Health Scale (BSHS), administered to groups 1- and 3-months post-intervention. Data analysis was conducted using SPSSv.21 software, employing the chi-square test, independent samples *t*-test, and repeated measures analysis of variance (ANOVA), with a significance level set at $P < 0.05$.

Results: One month post-intervention, the mean quality of life scores were 121.73 ± 7.52 in the intervention group and 122.93 ± 5.72 in the control group. After 3 months, these scores changed to 156.46 ± 9.53 in the intervention group and 122.82 ± 8.09 in the control group, indicating a significant increase in the intervention group ($P = 0.001$). Repeated measures ANOVA revealed no significant difference in quality of life between the 2 groups 1 month post-intervention ($P = 0.37$); however, a significant difference was observed at 3 months ($P = 0.001$).

Conclusions: The study's findings suggest that exercise can improve the quality of life in patients with shoulder joint burns. Therefore, incorporating exercise and follow-up programs into the discharge plans of burn patients is recommended.

Keywords: Burn, Shoulder Joint, Quality of Life, Exercise

1. Background

Burn injuries are one of the most significant causes of disability and death, with substantial economic and social consequences in human societies (1). Burns rank as the fourth most common unexpected event worldwide, following road accidents, falls, and interpersonal conflicts. According to the World Health Organization (WHO), over 300,000 people die annually from burns and their complications, with more than 95% of fire-related deaths occurring in low- and middle-income countries (2). In Iran, burns cause a mortality rate of 4.5 per 1000 people, resulting in 3 to 4 thousand deaths per year, which is considered statistically average. Specifically, there are 1375 deaths due to burns in Iran annually (3). In 2009, Sistan and Baluchistan Province reported 2115 burn incidents,

with 265 patients suffering 70 to 100% burns based on total body surface area (TBSA) (4).

Burns can lead to various effects, such as skin dysfunction, blood circulation disorders, and increased metabolism (5, 6). Pain is another significant issue in burn patients, leading to depression, decreased quality of life, and reluctance to accept treatment (7). Burns can cause skin hardening and tissue damage, restricting movement. Physiotherapy, including body massage, can alleviate pain and skin damage (3). Moreover, maintaining the range of motion (ROM) of joints after burn treatment or grafting is more challenging than after primary burn treatment, as the damaged tissues become contracted, firm, and thick, affecting joint ROM (4, 5).

Upper limb injuries are common in burn patients,

impacting vital social and occupational functions (8). The involvement of shoulder, elbow, and hand joints significantly affects daily activities such as bathing, dressing, and toileting. Large and small joint involvement can limit function and independence in burn patients (4, 6, 7). The shoulder joint, a biomechanical masterpiece and primary support for the body's organs plays a crucial role (8).

Although medical advancements have increased survival rates, burn survivors face numerous physical and psychological complications (9). These include burn scars, hypertrophic scars, joint contractures, movement disorders (e.g., decreased muscle strength, limited joint movement, loss of sensation), sensory disorders (oversensitivity, pain, itching, numbness), and social and mental disorders, severely impacting daily life and overall quality of life (10). Additionally, burn-related pain can lead to depression, dissatisfaction, delayed recovery, prolonged hospitalization, refusal of further treatment, and decreased quality of life (6). Quality of life encompasses subjective well-being and satisfaction with life experiences, reflecting an individual's perception and response to their health and other life aspects (11).

Limited ROM and pain due to immobility can significantly diminish well-being and quality of life in burn patients (12). Burns profoundly affect patients' quality of life, disrupting physical, mental, and social well-being (13). Severe burns can lead to lifelong disability and dysfunction, resulting from suboptimal recovery and associated with psychological and social disorders (14). Nursing staff are instrumental in enhancing burn patients' quality of life and independence by focusing on factors affecting their functioning (15).

Most prior studies on burn patients are descriptive, with interventional studies largely confined to the hospitalization period or shortly after discharge. Tang et al. examined joint contractures in severe burn patients and the impact of early interventions on length of stay, finding that rehabilitation significantly reduced the length of stay and pain intensity (16). Najafi et al. demonstrated that range of motion exercises improved activity and quality of life in burn patients (17).

Hand rehabilitation is a basic principle in the care of burn patients to encourage them to move in the range of motion. However, this important intervention is only considered for some patients, and its consequences appear in the form of various deformations, vital in burn care, which are often overlooked, leading to various deformities and functional disorders. Rahzani et al. showed that most patients with hand burns found that even those patients with minor degrees of hand burns suffer from experienced ROM disorders (18).

Extensive and permanent burn complications necessitate detailed treatment and procedures. As part of the rehabilitation team, nurses coordinate between patients, families, and team members, providing guidance and education. Considering the limited research on rehabilitation for burn patients, the high prevalence of such cases, and the inadequate treatment and follow-up leading to extensive complications.

2. Objectives

This study aims to examine the effect of an exercise program on the quality of life of patients admitted to the burn department of Ali Ibne Abi Talib Hospital in Zahedan in 2021.

3. Methods

This quasi-experimental study was conducted under the code of ethics IR.ZAUMS.REC.1400.276 took place in 2021 in Zahedan. The study population comprised patients with third-degree burns of the shoulder joint admitted to the burn department of Ali Ibne Abi Talib Hospital in Zahedan. Inclusion criteria included a third-degree burn on the shoulder joint as diagnosed by the attending physician, an age range of 18 to 50 years, a weight of less than 100 kg, a burn covering 15 to 45% of the body, at least 14 days elapsed since skin grafting, stable vital signs, the ability to read and write, and the absence of any malignancies or mental illnesses. Exclusion criteria were readmission to the hospital during the study, transplant rejection, or failure to perform the prescribed exercises more than twice daily and on two consecutive days.

Building upon a similar study by Najafi et al. (17) and utilizing the formula below, the sample size was initially estimated to be 1.7 persons per group, factoring in a 95% confidence interval and a 90% test power. However, to account for the potential dropout of participants, the sample size was adjusted to include 15 persons per group.

$$n = \frac{\left(Z_{1-\frac{\alpha}{2}} + Z_{1-\beta}\right)^2 (S_1^2 + S_2^2)}{\left(\bar{X}_1 - \bar{X}_2\right)^2}$$

$$= 1.7$$

$$Z_{1-\frac{\alpha}{2}} = 1.96; S_1 = 4.61, \bar{X}_1 = 169.55, Z_{1-\beta} = 1.64, S_2 = 12.56, \bar{X}_2 = 132.76$$

In this study, data were collected using a demographic information form, which assessed patients' general characteristics (age, sex, education, occupation, marital status, place of residence, burn percentage, and cause(s) of burn) and the Burn Specific Health Scale (BSHS).

The BSHS comprises 45 items, each scored on a 5-point Likert scale ranging from 1 to 5, where a high score (maximum 5) indicates good quality of life, and a low score (minimum 1) indicates poor quality of life. The scale evaluates heat sensitivity, effect, hand function, treatment regimens, work, sexuality, interpersonal relationships, simple abilities, and body image. The scale's total score, ranging from 45 to 225, reflects the quality of life, with higher scores indicating better quality. It includes 12 items measuring the physical dimension, 15 items for the psychological dimension, and 18 items for the social dimension of quality of life (15). The scale's reliability in this study was confirmed with a Cronbach's alpha of 0.94.

After obtaining the necessary permissions, data collection began. Patients were selected using convenience sampling from those scheduled for discharge from the hospital between September 2021 and March 2022. They were divided into intervention and control groups using six permuted blocks of 4 (A for the intervention group and B for the control group), such as AABB, ABAB, BBAA, etc. Each block included two members from each group. The block order was determined randomly using a random number table. Based on these blocks, Patients were assigned to either the intervention or control group.

The control group received only routine care. Both groups had the demographic form, and the BSHS completed one- and three-months post-intervention. The intervention group also received four individual training sessions about the disease, complications, range of motion exercises, and self-care activities (Table 1), provided after patients were physically and mentally ready (after admission to the post-transplant burn department). Training comprehension was assessed through questions and answers. All patients in both groups received the researcher's phone number for inquiries.

Table 1. The Content of the Training Intervention

| Sessions | Training Content | Duration (min) |
|----------|--|----------------|
| 1 | Introducing types of burns, burn complications, signs and symptoms, and new burn treatments | 5-10 |
| 2 | Self-care for burns - self-care training on physical activities, psychological support, training on sexual issues (to improve the dimensions of the perceived quality of life) | 20 |
| 3 | Introducing exercises to reduce the effects of immobility and then doing them practically | 20 |
| 4 | Exercises that prevent limited ROM and performing (stretching) exercises practically | 20 |

Following discharge, patients visited the burn

department every other day (three times a week) for dressing changes. Exercises to improve range of motion and daily activities were demonstrated and practiced during these visits. Exercise booklets were provided to the intervention group. One key exercise involved stretching movements of the involved hand, tailored to the patient's ability and repeated throughout the day. Patients practiced placing their hands on a wall to create strain in the joint muscles after removing the burn dressing. The exercise program was conducted 3 times a day for 12 weeks, with each movement repeated 10 times. Each session included 10 minutes of warm-up, stretching, range of motion, and strength exercises. Patients filled out exercise registration forms to track their progress. Those failing to perform the exercises more than twice daily for more than two days were to be excluded, but no patient was excluded from the intervention group. The BSHS was completed for intervention group patients one- and 3-months post-intervention.

Data analysis was conducted using SPSSv.21 software. The Shapiro-Wilk test was used to check data normality. Given the data's normal distribution and the quantitative nature of the dependent variable and levels of the independent variable, analysis was performed using the chi-square test, independent samples *t*-test, and repeated measures ANOVA, with a significance level set at less than 0.05 ($P < 0.05$).

4. Results

The chi-square test and independent samples *t*-test revealed no statistically significant differences in demographic and burn-related variables between the 2 groups (Table 2).

As shown in Figure 1, the mean quality of life scores for the burn patients in the intervention group who participated in the training program were 121.73 ± 7.52 one month after the intervention and 156.46 ± 9.53 3 months after the intervention. This demonstrates a significant increase in scores three months post-intervention compared to 1-month post-intervention ($P = 0.001$). In contrast, the mean quality of life scores for the burn patients in the control group, who did not receive any training, were 122.82 ± 8.92 one month after the intervention and 122.93 ± 5.72 3 months after the intervention, indicating no significant change between the scores at 1 month and 3 months post-intervention.

As indicated in the Table 3, the time-group interaction is significant ($P = 0.001$). This denotes a notable difference in the pattern of changes in the mean quality of life scores at 2 measurement points, namely one- and 3-months post-intervention, for patients in both the control and

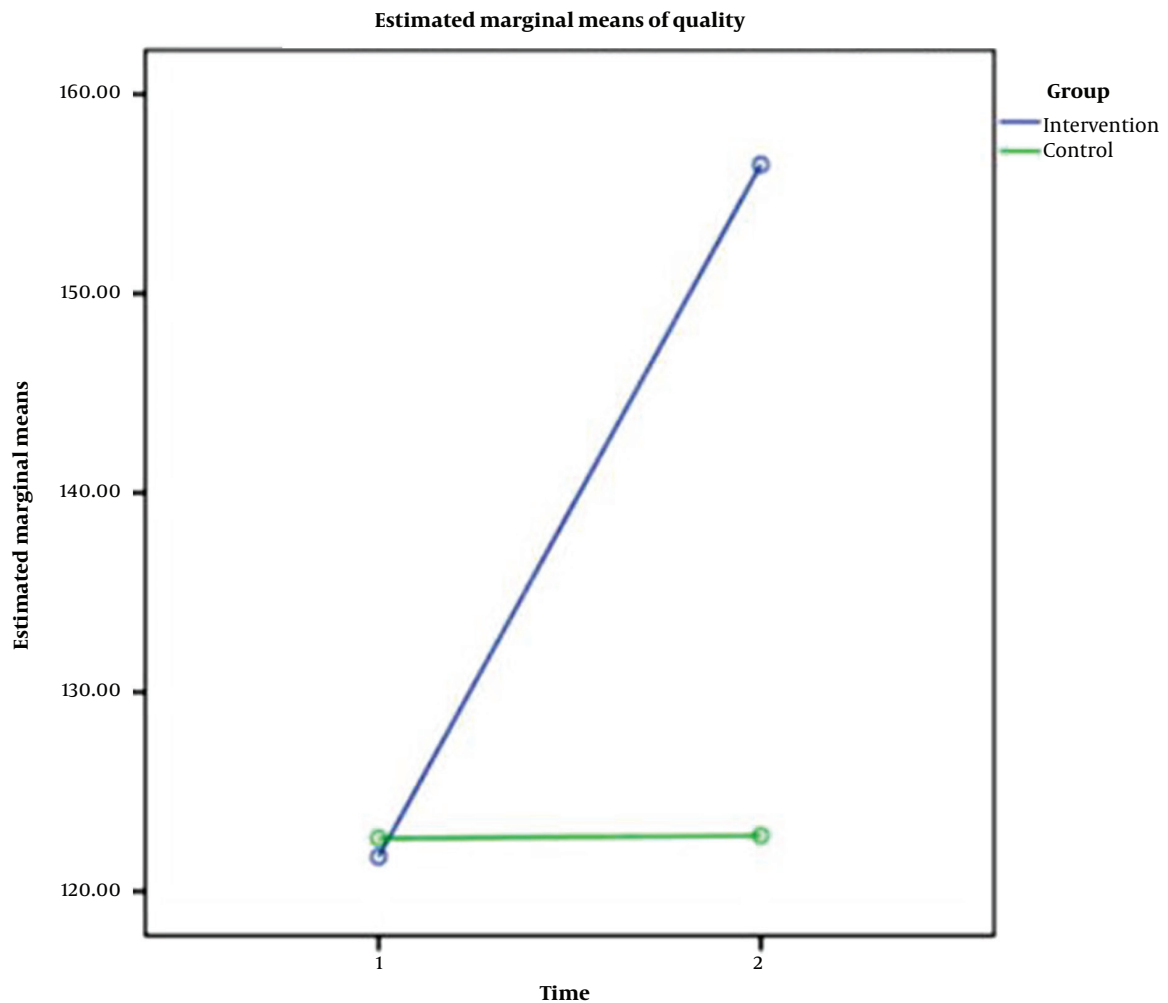


Figure 1. Changes in the quality-of-life scores in the two groups

intervention groups. Moreover, there was no significant difference in quality-of-life scores between the 2 groups 1 month after the intervention. However, a significant difference was observed three months post-intervention ($P = 0.001$). Pairwise comparisons using Bonferroni's test revealed a significant difference in the mean quality of life scores for the intervention group between 1- and 3-months post-intervention ($P = 0.001$). In contrast, pairwise comparisons indicated no significant difference in mean quality of life scores for the control group between these 2 time points ($P > 0.05$).

5. Discussion

The data from 30 burn patients suggest that performing range of motion (ROM) exercises can enhance

the quality of life in patients with third-degree burns of the shoulder joint. Similarly, Yurdalan et al. found that patients participating in an exercise program exhibited higher functional integrity and, consequently, an improved quality of life compared to those in the control group (19). In this study, physical therapy exercises were tailored to the burn site on the target joint, whereas the current study focused on rehabilitating the shoulder joint due to its significant impact on daily activities and quality of life. Both studies demonstrate that exercise can enhance the quality of life by improving physical functioning. Engaging in exercises appears to enhance patients' ability to perform daily activities and boosts their efficiency, leading to increased self-esteem, mental and emotional recovery, reduced anxiety and fear, and ultimately, an improved quality of life.

Table 2. The Demographic Data of the Participants in the Two Groups ^a

| Variables and Categories | Intervention Group | Control Group | P-Value |
|------------------------------|--------------------|---------------|-------------------|
| Age (y) | 32.8 ± 7.1 | 34.5 ± 8.74 | 0.57 ^b |
| Burn severity | 40 ± 4.94 | 41.8 ± 7.88 | 0.47 ^b |
| Gender | | | 0.5 ^c |
| Male | 8 (53.3) | 9 (60) | |
| Female | 7 (46.7) | 6 (40) | |
| Education | | | 0.71 ^d |
| Lower education | 9 (60) | 10 (66.6) | |
| Diploma and higher education | 6 (40) | 5 (33.4) | |
| Place of residence | | | 0.73 ^c |
| Urban areas | 7 (46.6) | 8 (53.4) | |
| Suburban areas | 8 (53.4) | 7 (46.6) | |
| Employment | | | 0.46 ^c |
| Employed | 8 (53.4) | 8 (53.4) | |
| Unemployed | 7 (46.6) | 7 (46.6) | |
| Marital status | | | 0.78 ^d |
| Married | 9 (60) | 10 (66.6) | |
| Single | 6 (40) | 5 (33.4) | |
| Burn reasons | | | 0.20 ^d |
| Physical | 4 (26.6) | 7 (46.6) | |
| Chemical | 11 (73.4) | 8 (53.4) | |

^a Values are presented as No. (%) or mean ± SD.

^b Independent samples *t*-test

^c Chi-square test

^d Fisher's test

Perera et al. also found that early stretching exercises significantly improved shoulder joint range of motion and functional recovery in burn patients (20). Although their intervention lasted only 14 days post-discharge, it showed notable improvements in shoulder joint mobility. In contrast, the intervention in the current study spanned 12 weeks, longer than Perera et al.'s program. Additionally, Najafi et al. demonstrated that range of motion exercises increased daily living activity and quality of life in burn patients in the intervention group (17). Their intervention, conducted over 4 weeks for joint burn patients, showed that quality of life improved as patients gained independence in performing daily activities, a finding also confirmed in the current study. Indeed, effective social interactions are essential for human satisfaction, and individuals tend to feel more content with fulfilling social relationships (21)."

In a study by Ardabili et al., it was found that sports exercises significantly improved the range of motion in the hands of burn patients from admission to discharge (5). This study focused solely on the hospitalization period, with no follow-up conducted post-discharge. In contrast, the present study included exercise follow-up after patient discharge. Cabulon et al. also demonstrated that a treatment program based on a psychosocial model could accelerate improvements in the quality of life for burn patients. The study highlighted the important role of daily physical activity in enhancing overall quality of life (22).

Grisbrook et al. investigated the impact of exercise training on health-related quality of life in long-term survivors of major burn injuries, finding that physical therapy training positively influenced both physical health and quality of life in burn patients (4). In their study, 9 acute burn patients participated in a 12-week exercise program.

Tang et al. found that range of motion exercises enhanced daily life activities and quality of life in burn patients, indicating the effectiveness of rehabilitation interventions in improving daily activities (16). The exercises in their study were not limited to the hands and differed from those in the current study.

Li et al. reported findings consistent with the current study, showing that rehabilitation nursing interventions improved burn patients' physical health and quality of life (23). Rosenberg et al. also found that a hospital-based wellness and exercise program enhanced the physical and psychosocial aspects of burn patients' quality of life (15). Their study, however, was confined to the hospital setting and the duration of the patients' hospitalization, whereas the current study extended exercises into the home setting and included follow-up using a checklist.

The present study specifically focused on patients with shoulder joint burns, which limits the generalizability of its findings to all patients with hand burns. Additionally, the small sample size may have impacted the study's results.

5.1. Conclusions

The findings of this study demonstrate that implementing exercise training and follow-up programs for burn patients effectively improves their quality of life. Therefore, such training and follow-up should be integrated into the post-discharge care plans for burn patients."

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Table 3. The Results of Repeated Measures ANOVA for Quality-of-Life Scores

| Source of Changes | Sum of Squares | df | Mean Squares | F | Sig. | Effect Size | Test Power |
|------------------------|----------------|----|--------------|---------|-------|-------------|------------|
| Time | 4018.017 | 1 | 4018.017 | 2.236 | 0.001 | 0.717 | 0.067 |
| Group | 4558.717 | 1 | 4558.717 | 467.634 | 0.001 | 0.711 | 1 |
| Group-time interaction | 4489.35 | 2 | 4489.35 | 9.532 | 0.001 | 0.708 | 0.361 |

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Footnotes

Authors' Contribution: FZ: Study design, data collection, preparation of paper draft; MRA: Study design, final approval of paper; FY: Study design, data analysis, final approval of paper.

Conflict of Interests: There was no conflict of interest in this study.

Data Availability: The dataset presented in the study is available on request from the corresponding author during submission or after publication.

Ethical Approval: This research project was approved by Zahedan University of Medical Sciences with the ethics code IR.ZAUMS.REC.1400.276, and the authors followed all required protocols.

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Informed Consent: All patients who met the study criteria gave written consent. All patients signed an informed consent form.

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