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ORIGINAL PAPER

Effect of burn rehabilitation program on improving quality of life (QoL) for hand burns patients: a randomized controlled study

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Abstract

Background Burn injuries, including hands are one of the most devastating injuries. Hand burns do not often play a major role in the mortality. But, they represent a huge problem that may eventually lead to chronic disabilities, lifelong impairment, and significant functional and occupational limitations. These comorbidities can negatively affect a patient's quality of life (QoL) besides, making re-integration into society is difficult. This study aims to investigate the effect of our designated burn rehabilitation program on improving quality of life of hand burns patients.

Methods A randomized controlled study was conducted for 12 months at Mansoura University Burn Center. It included 60 adult patients with hand burns who were randomly divided and assigned to a study and control groups. Both groups underwent basic rehabilitation. A newly designed program was implemented for the study group. Data were collected using three tools; bio-socio demographic characteristics, the Burn Health Knowledge Questionnaire, and the Burn Specific Health Scale-Brief (BSHS-B). The quality of life of patients with hand burns was evaluated three times.

Results One month and three months after implementing the burn rehabilitation program, the total mean scores for the QoL of patients in the study group improved from 31.1 ± 11.3 to 118.5 ± 21.3 and 135.4 ± 24.3, respectively ($P < 0.001$). In addition, the changes in QoL of the patients in the control group significantly improved from 24.8 ± 12.1 to 57.6 ± 19.1 and 87.5 ± 23.8, respectively ($P < 0.001$). Despite this steady improvement in the control group, the mean scores on the QoL sub-scales and total mean scores remained lower than those in the study group.

Conclusions Based on the results obtained in the current study, the design and implemention of a burn rehabilitation programme based on clinical knowledge improves the quality of life of patients with burns. Therefore, this program is recommended for use early as a part of the treatment process for patients with burns.

Level of Evidence: Level I, risk/prognostic study.

Keywords Burn rehabilitation program · Hand burn · Quality of life

Introduction

Burn injuries are a widespread health problem, one of the most devastating injuries, and the fourth frequent most type of trauma following traffic accidents, falls, and interpersonal violence, causing death and disability worldwide [1]. In the USA, it is estimated that each year there are about 486,000 patients are treated for burns annually, while 40,000 of them require hospitalization and 3275 patients die every year [2]. In Egypt, burns are considered a major health problem and are associated with high mortality and morbidity [3]. The last Egyptian estimates, according to the data provided by the Statistical Records of the Central Agency for Public Mobilization and Statistics in Egypt (2013), revealed that up to 11,697 burn patients were treated in governmental Egyptian hospitals, a number that has increased over the last few years from, 2008–2011. Based on documentation from the statistical records of Mansoura University Hospital (2016), where this study was coducted, more than 200 burn victims require inpatient care yearly.

The hand is considered one of the most common areas of the body that is vulnerable to burns [4, 5]. Although hand burns affect less than 5% of the total body surface area, they

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are ranked as severe trauma, requiring extensive treatment in a specialized burn center. Hand burns do not often play major roles in mortality, but they can cause crippling deformities and disabilities, which may affect the patient's ability to perform daily living activities and fine tasks, and subsequently may lead to significant functional restrictions and impairments in physical and psychological health, and overall quality of life (QoL) [6, 7]. Consequently, the term "Burns Rehabilitation" comes to enable individuals with these disabilities to reach their optimal degree of physical, psychological, and social functioning and well-being by reducing the undesirable effects caused by the injury in terms of maintaining range of movement, minimizing scarring and contracture development, maximizing functional ability, and improving overall aspects of QoL [8, 9].

Therefore, the health team, particularly the nursing staff, should pay attention to various aspects of QoL dimensions during patient recovery, which may contribute to early identification of the affected domains. Furthermore, the early detection of the difficulties faced by patients with burns during the rehabilitation process allows the health care providers to plan targeted care that is intiated early and promotes continuity of care after hospital discharge to obtain the best results and prevent the onset of complications. In addition, measurements of the physical and psychological outcomes of burns patients are necessary to optimize a multidisciplinary treatment and restore QoL [10, 11].

Considering, the importance of patient education regarding hand burn rehabilitation in preventing the complications of burns and its effect on improving health-related quality of life (HRQoL) based on the results of recent studies [12–17]. Therefore, we attempted to investigate the effects of education on quality of life by formulating a burn rehabilitation program among patients with hand burns.

Materials and methods

Study populations

This study was a randomized controlled study, in which the effects of the implementation of a burn rehabilitation and education program on the QoL of burn patients admitted to the Mansoura University Burn Center in Egypt, were evaluated. A total sample of 60 conscious adult patients who suffered from hand burns and were admitted to the above-mentioned setting were recruited for participation in the current study. The study sample was selected by convenience sampling based on the inclusion criteria, and then each participant was assigned a number. By randomly selecting numbers, the study subjects were assigned to two equal groups, each group consisted of 30 adult patients. Both groups underwent basic rehabilitation. The control group received routine physiotherapy and rehabilitation in the burns center, and the study group received the newly designed educational rehabilitation program. The inclusion criteria were as follows: all patients suffer from recent hand burns, had deep 2nd, and 3rd degrees burns with a total body surface area (TBSA) of 10–50%, and were aged between 20 and -60 years old, were hemodynamically stable, and were able to communicate and cooperate with the program. The exclusion criteria included a history of any chronic disease or other co-morbid diseases such as diabetes and heart disease, psychological problems and mental disabilities, and participation in another burn rehabilitation program. Both the study and control groups were matched as much as possible regarding bio- socio-demographic characteristics and burn-related data to control for variables that could affect the results of the study.

Measurement of the variables

The instruments for data collection included Socio-demographic characteristics and burn-related data, The Burn Health Knowledge Questionnaire, and the Burn Specific Health Scale-Brief (BSHS-B) questionnaire. The socio-demographic characteristics of the study sample were recorded; age, sex, residence, social status, level of education, and occupation. Burns-related data for the study sample included; the length of hospital stay, type of burns, site of injury, total body surface area (%TBSA), and the degrees of burns. The Burn Health Knowledge Questionnaire was developed by the researcher after reviewing the relevant and recent national and international scientific literature [18–20] to identify patients' learning needs as a pre-requisite for planning the burn rehabilitation program and to evaluate patients' knowledge before and after the implementation of the proposed burn rehabilitation program. This questionnaire consisted of (33) questions covering three well-defined areas: general knowledge about burns (7 items), rehabilitation modalities (16 items), and burns related healthy lifestyle modifications (10 items). The total scores were computed out of (167 grades). A higher score indicated better knowledge.

The Burn Specific Health Scale is the only specific burn outcome measure. It was originally developed by Blades et al. in 1982 and was subsequently been abbreviated (BSHS-A.) by Munster et al. in 1987, and revised (BSHS-R.) by Blalock et al. in 1994, and the most recently brief version was produced (BSHS-B) by Kildal et al. 2001. This scale is consistently and widely used in burn area to examine the physical and psychosocial functioning of burn patients and their HRQoL [21].

The "BSHS-B" consists of (40) questions covering a nine well-defined domains: four in the area of physical status (simple ability, hand functions, heat sensitivity, and treatment regimen), and five in the area of psychosocial status (affect, body image, interpersonal relationship, sexuality, and work). The scoring system is performed as follows: responses to each of the 40 items are rated on a five-point Likert scale from zero

(extremely) to four (not at all) Mean scores are calculated for each domain. The maximum score was 160 points and the minimum score was 0. This final score reflects alterations in the patients' QoL. A higher mean score indicates a more positive evaluation of function and higher health-related quality of life.

Content validity and reliability

Validity was done to the developed study instrument (Socio-demographic and burn-related data and the Burn Health Knowledge Questionnaire) to determine whether the tools covered the aims of the current study and to confirm that the standardized tools (BSHS-B) were appropriately translated. It was revised by a panel of ten experts in the field of the study (medical-surgical nursing, burn and plastic surgery, and physical therapy specialists) to test the validity and feasibility of the current study tools. Reliability was estimated to be 0.896 using Cronbach's alpha coefficient to measure of the internal consistency of an Arabic translation of the BSHS-B.

Rehabilitation program

A proposed rehabilitation program was established and included both knowledge and practices that guide patients' treatment during recovery. The contents of the program included an educational component and a training component. The educational part consisted of general information about the following: general knowledge about burns, rehabilitation modalities, and healthy lifestyle. The practical part involved the following: anti-contracture positioning, therapeutic exercises, and massage therapy training. Arrangements for the practical training were made with the physician and physiotherapist regarding the performance of joint exercises (ROM), as well as the time and number of exercises. The researcher directly observed patients in both groups during exercise training to ensure that the exercises were performed. The designed burn rehabilitation program was implemented for the study group individually. It was conducted in 6 sessions; each session required approximately 45 to 60 min (according to the activities performed in each session and the attention span of the patients). The teaching methods were composed of lectures, role-playing exercises, group discussions, and real-life demonstrations. Audiovisual aids included a Microsoft Power Point presentation (PPT), illustrated pictures, videos, and a burn rehabilitation booklet (handout). Before starting each session, burned patients were asked questions about the topic discussed in the previous meeting to ascertain their level of understanding, and forgotten or vague points were emphasized by the researcher. Then, a summary of the previous session was offered to help the patients to refresh their memories. During each session, the researcher followed the teaching strategies for patients using simple, concise, and clear words. At the end of each session, a brief summary of the important points was provided to each patient. Moreover, an instructional booklet was given to each patient in the study group to attract his or her attention, motivate him or her, and support teaching and practice at home. Each patient in the study group was monitored daily by the researcher during hospitalization until he or she was discharged from the hospital to insure that the instructions were followed correctly. Afterwards, each patient recieved regular telephone calls after discharge that continued for 3 months to ensure patient adherence to the treatment plan. Moreover, patients' problems and concerns that face patient after discharge were discussed. Then the patients were seen by qualified nurses for 6 months and reported to the rehabilitation coordinator about any lags in the process.

Each study subject was assessed in three phases to evaluate the effect of the proposed burn rehabilitation program. The first phase (pre-test) was done within 3–5 days after hospital admission, the second phase (post) was done after 1 month, and the third phase (follow-up) was done after 3 months. Data were collected, analyzed and the comparison between both control and study group's finding was done to evaluate the effectiveness of the burn rehabilitation program on health-related quality of life by using the proper statistical analysis. To prevent bias, all questionnaires were asked by a blindly chosen nurse or medical student.

Statistical analysis

Statistics were carried out using IBM SPSS version 20. All the statistical analysis was done using two-tailed tests and the alpha error of 0.05. The *P* value less than or equal to 0.05 was considered to be statistically significant. Finally, the data were analyzed by using range and mean with standard deviation (SD) for descriptive numeric data, while for categorical data, percentage was used to describe the frequency of each category. Tests used for comparison between two groups incorporated: independent sample *t* test, ANOVA test, Friedman's test, and test of marginal homogeneity. Monte Carlo exact test and Fisher's exact test were used as alternatives for the Pearson's chi square test if there were many small expected values.

Results

In this study, there were no statistically significant differences detected between the two groups regarding their bio-socio demographic characteristics and burn-related data ($P = > 0.05$).

Regarding socio-demographic characteristics, most of our patients were in the young adult group in between 20 and 30 years. Male represented 53.3%, 63.3% of our population in the study and the control groups, respectively. Around 66.7% of the patients in the study group and 56.7% in the

control group were married. Furthermore, 40 % in the study group were graduates of the secondary school, while in the control group, they were 60.0%. Skilled manual workers were 56.7 and 53.3%, respectively (Table 1).

Concerning burn-related data, thermal burn represented the highest proportion among the study and control groups 93.3 and 73.3%, respectively. Most of the study and control groups were accidentally burned (93.3%and 86.7%, respectively) and they had mixed second- and third-degree burns (83.3 and 80.0%), respectively. The most common sites of the body affected by burn in addition to hands were the head and neck, upper limbs (56.7 and 46.7%) followed by the lower limbs (33.3 and 30%), and anterior trunk (10.0 and 23.3%) in the study and the control groups, respectively. TBSA% of the injured patients in the study group ranged from 15 to 50%, with a mean score of 27.5 ± 11.0, while it ranged from 15 to 40% with a mean score of 28.3 ± 7.2 for those in the control group (Table 2).

Comparison of the knowledge scores of the patients in both groups after implementation of the program revealed that the total knowledge scores were statistically significantly higher among the study group patients, compared to the control group patients throughout the program phases (1 month, 3 months) ($P = 0.0010$*). (Table 3).

Regarding burn patient's HRQoL that was assessed by the BSHS-B, we observed that after the implementation of our program, the QoL total mean scores of the patients in the study group were significantly improved from 31.1 ± 11.3 to 118.5 ± 21.3 and 135.4 ± 24.3, respectively ($P < 0.001$). Inaddition, we noticed that the changes in the QoL scores of the patients in the control group significantly improved from 24.8 ± 12.1 to 57.6 ± 19.1 and 87.5 ± 23.8, respectively ($P < 0.001$), but their overall mean scores were lower than patients in the study group (Table 4).

Table 1 Frequency distribution of the study and control groups regarding their socio demographic data

Demographic data	Study group		Control group		*P* value
	N = 30	%	*N* = 30	%	
Age (years)					
20 –	18	60.0	18	60.0	0.123
30 –	3	10.0	8	26.7	
40 +	9	30.0	4	13.3	
Range	21–55		21-59		
Sex					
Male	16	53.3	19	63.3	0.432
Female	14	46.7	11	36.7	
Residence					
Rural	25	83.3%	22	73.3	0.347
Urban	5	16.	8	26.7	
Marital status					
Single	10	33.3	12	40.0	0.490
Married	20	66.7	17	56.7	
Divorced	0	0.0	1	3.3	
Level of education					
Illiterate	5	16.7	2	6.7	0.687
Read and write	3	10.0	2	6.7	
Primary	4	13.3	4	13.3	
Preparatory	3	10.0	2	6.7	
Secondary	12	40.0	18	60.0	
University	3	10.0	2	6.7	
Occupation					
Manual work	17	56.7	16	53.3	0.549
House wife	6	20.0	9	30.0	
Employee	2	6.7	3	10.0	
Non worked	5	16.6	2	6.7	

P Monte Carlo exact probability (MCP)

*$P < 0.05$ (significant)

Discussion

Recent studies have examined the long-term adjustments after burn injury proved that more patients suffer from decreased quality of life after the injury when they are compared with healthy groups. Additionally, the burn severity and related physical, psychological, and psychosocial manifestations that accompany burns trauma are very important factors that compromise the quality of life over time. Moreover, hand burns problems, deformities, and loss of muscle function and sensation have a highly significant impacts on the hand function and QoL throughout the entire recovery process [12–15].

Education is very important to encourage burned patients to accept responsibility for their rehabilitation; they can carry out prescribed therapy, manage symptoms, recognize the onset of complications, and seek health care very early when they are confronted with any new situations. With adequate knowledge and training in self-care skills, well-informed and educated patients are more likely than uninformed patients to be concerned about their health and to sdo what is necessary to maintain it [18].

From this perspective, our study showed that there was a positive improvement in the level of knowledge of the study group after applying the burn rehabilitation sessions, in comparison with the control group with a statistically significant difference between them, which indicates the success of the rehabilitation program. This result can be justified as when the patient is regarded as an important person, he or she becomes motivated, ready to learn, and participate actively to return quickly to the pre-injury level of functioning. This result is in accordance with a study carried out by Radwan et al. (2011) who reported that their subjects in their study group exhibited a significant improvements in the scores of knowledge compared to the control group after participating in the rehabilitation program [22]. In the same direction, a study done

Table 2 Frequency distribution of the study and control groups regarding their burn-related data

Burn-related data	Study group		Control group		*P* value
	N = 30	%	*N* = 30	%	
Cause of burn injury					
Thermal burn	28	93.3	22	73.3	0.106
Chemical burn	2	6.7	7	23.3	
Electrical burn	0	0.0	1	3.3	
Circumstances (mode) of injury					
Accidental	28	93.3	26	86.7	0.584
Suicidal	11	3.3	3	10.0	
Others	1	3.3	1	3.3	
Degree of burns					
Second-degree burn	1	3.3	2	6.7	0.788
Third-degree burn	4	13.3	4	13.3	
Mixed second and third degrees	25	83.3	24	80.0	
Affected hand					
Both hands	28	93.3	30	100.0	0.355
Right hand	1	3.3	0	0.0	
Left hand	1	3.3	0	0.0	
Dominant hand					
Right hand	30	100.0	28	93.3	0.150
Left hand	0	0.0	2	6.7	
Site of burn in addition to hands					
Upper limbs and head and neck	17	56.7	14	46.7	0.455
Upper limbs and anterior trunk	3	10.0	6	20.0	
Upper limbs and lower limb	10	33.3	10	33.3	
Total body surface area (TBSA)%					
Range	15–50%		15–40%		0.32 (0.751)
Mean ± SD	27.5 ± 11.0		28.3 ± 7.2		
Median	25		29		

P Mont Carlo exact probability (MCP)

*$P < 0.05$ (significant)

by O'Brien et al. (2012) showed that the implementation of an educational program based on the learning needs of the patient with hand and upper limb burns increased their adherance to treatment [23]. Also, this result lies in agreement with Mandal (2007) who reported similar improvements in the knowledge after implementing educational programs [24].

Lin and his colleagues emphasized that hand function is a very important functional outcome, affecting burn survivors' quality of life, as it is strongly predictive of successful re-integration into society and return to professional life [7]. Many studies confirmed negative effects of burn injury on patients' QoL and in a study done by Orwelius et al. (2013) it was found that burned patients have often had an altered HRQoL after the injury, when compared with healthy control groups [14]. Also, Cowan and Stegink-Jansen (2013) reported that full thickness injury, loss of hand function, and digital contractures are predictors of diminished physical QoL [25]. Moreover, Grisbrook (2012) confirmed that burned ones in comparison with their non-burned colleagues have a lower quality of life [26]. In addition, Elsherbiny et al. (2011) concluded that burn injury has a negative impact on the patient's overall quality of life and recommended that improving patient's quality of life can be achieved through a proper educational program, addressing patient's physical and psychological needs, can promote burn patients' recovery and help them to achieve optimal health and maintain lifelong quality [27].

In this context, the findings of the current study show that, after the implementation of the rehabilitation program, there was a positive improvement in all dimensions of the health-related quality of life (HRQoL) as measured by Burn Specific Health Scale (BSHS-B) in the study group, in comparison with the control group with a statistically significant difference between the two groups. This improvement may be related to the fact that knowledge can play an essential role in reinforcing patient to carry out healthy behaviors and continuous education, motivating them by caring for their feelings and addressing and meeting their needs that consequently make them modify their lifestyles toward healthy and the lifelong quality of life.

Also, the obtained results from the control group have shown considerable improvement in the quality of life for these patients with time. Despite this steady improvement, the mean score of QoL sub-scales and total mean scores remained lower than patients in the study group. This result

Table 3 Effect of burn rehabilitation program on knowledge of the studied groups after implementing of sessions

Overall burn knowledge	Study			*F* (*P*)	Control			*F* (*P*)
	Pre	After 1 month	After 3 months		Pre	After 1 month	After 3 months	
Minimum	0.00	35.00	35.00	18.4 (0.001)*	0.00	0.00	0.00	6.1 (0.096)
Maximum	11.00	143.00	133.00		19.00	34.00	30.00	
Mean ± SD	1.57 ± 3.13	101.50 ± 35.09	88.90 ± 30.10		2.07 ± 5.17	10.79 ± 8.83	11.26 ± 8.98	

F repeated measures ANOVA

*$P < 0.05$ (significant)

Table 4 Effect of burn rehabilitation program on health-related quality of life after implementing of sessions in both study and control groups

Burn Specific Health Scale total scores											
Program phase	Before		*P* value	After 1 month		*P* value	After 3 months		*P* value	*P* value	
Group	Study Mean ± SD	Control Mean ± SD	*t* test (p)a	Study Mean ± SD	Control Mean ± SD	*t* test (p)b	Study Mean ± SD	Control Mean ± SD	*t* test (p)c	*F* (p)1	*F* (p)2
BSHS-B items											
Simple abilities	0.4 ± 1.0	0.5 ± 1.3	0.731	8.6 ± 2.5	4.5 ± 2.6	0.001*	10.7 ± 2.4	7.8 ± 3.3	0.001*	18.6 (0.001)*	8.6 (0.001)*
Hand function	0.7 ± 1.9	0.3 ± 1.6	0.425	14.1 ± 6.4	7.2 ± 5.5	0.001*	17.8 ± 4.5	11.7 ± 4.4	0.001*	15.2 (0.001)*	7.9 (0.002)*
Affect	12.0 ± 6.6	6.2 ± 6.2	0.001*	26.2 ± 3.3	11.7 ± 6.0	0.001*	26.4 ± 4.5	16.2 ± 6.7	0.001*	15.4 (0.001)*	6.6 (0.003)*
Body image	1.5 ± 3.0	1.5 ± 3.1	0.933	12.9 ± 3.9	2.9 ± 0.3	0.001*	14.2 ± 3.4	5.0 ± 3.1	0.001*	16.9 (0.001)*	6.2 (0.003)*
Interpersonal relationship	13.9 ± 3.1	12.3 ± 4.5	0.128	15.5 ± 1.5	13.9 ± 2.6	0.001*	15.7 ± 0.9	14.6 ± 2.8	0.048*	8.9 (0.001)*	5.0 (0.032)*
Sexuality	0.2 ± 0.8	–	0.211	8.2 ± 2.5	3.7 ± 2.0	0.001*	9.6 ± 2.8	5.8 ± 2.9	0.001*	15.4 (0.001)*	8.1 (0.001)*
Heat sensitivity	0.7 ± 2.2	2.1 ± 2.1	0.014*	11.3 ± 3.3	4.6 ± 2.9	0.001*	13.5 ± 3.2	8.3 ± 4.0	0.001*	16.7 (0.001)*	8.3 (0.001)*
Treatment	0.3 ± 1.3	0.3 ± 1.3	1.00	14.9 ± 3.6	6.4 ± 4.2	0.001*	18.0 ± 3.9	13.9 ± 5.0	0.001*	16.3 (0.001)*	9.1 (0.001)*
Work	1.6 ± 2.2	1.5 ± 2.2	0.953	9.0 ± 2.7	4.3 ± 2.6	0.001*	12.3 ± 2.7	6.6 ± 2.6	0.001*	15.8 (0.001)*	7.9 (0.001)*
BSHS total scores	31.1 ± 11.3	24.8 ± 12.1	0.043*	118. 2 ± 21.3	57.6 ± 19.1	0.001*	135.4 ± 24.3	87.5 ± 23.8	0.001*	16.0 (0.001)*	8.4 (0.001)*

Using ANOVA repeated measures (F) in comparing mean score of quality of life within each group. *F* (p)1: comparing quality of life mean score before, 1 month, and 2 months after rehabilitation in the study group. *F* (p)2: comparing quality of life mean score before, 1 month, and 2 months after rehabilitation in the control group

Using Student's *t* test (*T*) in comparing mean score of hand function between study and control group. *T* test (p)a: comparing quality of life mean score among the both groups pre-rehab. *T* test (p)b: comparing quality of life mean score among the studied groups 1 month after rehab. *T* test (p)c: comparing quality of life mean score among the study and the control groups 2 months after rehab

*$P < 0.05$ (significant)

reflects that physical recovery and wound healing that normally occurs by time can improve quality of life of a burned patient, but this improvement is slower and lower than patients who are educated and motivated.

The presented results are consistent with those of other studies in this field. In an earlier study that was conducted in Egypt by Radwan et al., they reported that the implementing a rehabilitation program would improve the physical, social, and mental function of the patients after burns [22]. Grisbrook et al. also reported that a training program based on the education of burn survivors could improve the quality of life [26]. This concept was supported by Hashemi and his colleagues and they concluded that the quality of life in burn patients was significantly higher in patients who actively participated in the proposed self-care educational program than those who did not [17]. Another supported study that was done by Tang et al. it revealed that the earlier the burn rehabilitation the better the QoL [28]. In contrast, Roh et al. (2011) examined the effect of the burn rehabilitation nursing program on burn-specific health. They found that the patients' QoL did not change significantly after program implementation [29]. These results could be explained by the fact that the rehabilitation program in "Roh et al.'s study" focused mainly on the patients' physical care and skin massage only. If we want to witness an improvement in the QoL, we have to establish a comprehensive program that archive equal attention to the physical as well as the psychosocial recovery for the burned patient.

The current study showed that improvement in burn patients' knowledge in the study group was also associated with improvements in their health-related quality of life scores. This finding also confirmed the role of the educational rehabilitation program on changing the burned patients' health-related quality of life. The current study shared a similar result with the study done by Radwan (2011) who found that increased knowledge of patients in the study group was also associated with higher BSHS-B total scores [22]. In this respect also, Masood et al. (2016) revealed that developing and implementing a rehabilitation program for burned population would help them in coping with burns in an effective manner [30]. Another supported study by Paratz et al. (2012) confirmed that physiotherapy educational program for patients with hand burn promoted the physical and functional outcomes and had a positive effect on psychological consequences of these patients [31].

Finally, different studies emphasized the importance of teaching burns' patients through a planned educational program, which considered an effective method used to prevent the unforeseen burn deformities in the patient care process. Although education to patient has a positive effect on the clinical outcomes and complications caused by burning, recent researches in this field show that those who take care of patients, especially nurses, do not pay enough attention to patient education regarding hand burns rehabilitation therapy and this issue plays an actual role in the functional disorders and disabilities caused by it. [16, 32, 33].

Going with this context, health care professionals involving nurses should prepare a comprehensive rehabilitation program based on the patient's needs and their actual health problems, prepared for the first day of admission and incorporating knowledge and practical training through all phases of burn care and adjusted as needed for each patient to achieve optimal functional outcomes and lifelong quality [17, 34].

The present results show that implementation of an educational burn rehabilitation program based on burned patients' needs can be effective in improving their quality of life. Therefore, a comprehensive and well-designed program which tailor patients' concern and touch their needs can reduce complication, promote health, and improve the overall quality of life. Also, QoL assessment can help the nurse to identify patients' needs and areas of quality of life that may be affected by the burn injury. Hence, effective nursing intervention can be developed to improve the quality of life for those patients.

Since the effect of the programs has been evaluated in a limited time and focused on hand burns only and cannot follow patients after discharge for more than 3 months (limitations of the study), therefore it is advisable to evaluate the effect of a rehabilitation programme in burned patients by following them for 6 months to 1 year after burn injury and evaluate the effect of intervention on other burn sites.

Conclusions

The QoL of patients with hand burns was significantly improved after they participated in a burn rehabilitation program. We recommend the initiation of a national educational program based on the rehabilitation needs of each burn injured patient to support the ability of healthcare professionals to provide front-line care for those patients and the creation of a well-organized system for educating patients in a meaningful manner to decrease post-burn complications and to improve overall health status and QoL

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Compliance with ethical standards

Conflict of interest Ola Ebrahim Elsherbiny, Mohamed Hassan El Fahar, Soheir Mohamed Wehada, Amany Mohamed Shebl, and Wafaa Ismail Shrief declare that they have no conflict of interest.

Ethical Approval Initial permission to conduct the study was obtained from the research ethics committee in the Faculty of Nursing Mansoura University and the study was approved by the ethical committee research

of the hospital. All procedures performed were in accordance with the 1964 Helsinki declaration and its later amendments.

Patient consent Each patient was interviewed individually and informed about the purpose and importance of rehabilitation on burns outcomes. Informed consent was taken from patients. The researcher was emphasized that the privacy and confidentiality of all information were secured by coding data, participation is voluntary, and they have the right to refuse or withdraw from the study at any time. The study maneuvers could not entail any harmful effects on participants. At the end of the program, in order to fulfill the ethical considerations of the study, professional help was provided to all participants whenever needed and telephone number of the researcher was given to all patients in the intervention and control group to answer their questions. Also, the instruction manual booklet was provided to the control group and necessary guidance was given as well.

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