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Effect of a rehabilitation program on quality of life among 2nd degree burn adolescents: Quasi experimental study

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***Abstract*---**Background: Burn injuries can have profound physical, psychological, and social effects on adolescent when identity and self-esteem are developing. Adolescents with 2nd degree burn injury often face challenges on quality of life, which may include physical pain and discomfort, functional limitations, body image concerns, social isolation, and difficulties with school. Aim of the study: is to assess the effect of a rehabilitation program on quality of life of 2nd degree burn adolescents. Research design: A quasi experimental design was used in study. Study subjects consisted of 100 2nd degree burn adolescents. Setting: The study was conducted at burn unit of plastic surgery department and related outpatient clinic at Ain Shams University Hospitals, Cairo, Egypt. Tools: Data was collected using 1): Demographic characteristics of the studied adolescents and their medical data; 2): Pre-post Burn Specific Health Scores-Brief (BSHS-B) assessment; 3) Pre-post Burn Patients' health care needs assessment; 4) Pre-post Children's Dermatology Life Quality Index. Results: It

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revealed improvement in the adolescents' posttest good quality of life from 31% to 61% after conduction of the rehabilitation program. Also, the total mean score of BSHS-B and total health care needs were improved by 75.26±18.6 and 39.25±3.79. Conclusion: The rehabilitation program highlighted a significant improvement in the burn adolescents' quality of life based on the positive change in their burn specific health score and health care needs. Recommendations: Effective educational programs for burn assigned nurses and other members of the multidisciplinary rehabilitation team and creating a rehabilitation program for burn patients before discharge.

***Keywords*---**Rehabilitation Program, Quality of Life, Adolescents, 2nd Degree Burn.

Introduction

Burn is a trauma that can happen to anyone, at any time and in any place (ABA, 2018). The World Health Organization (WHO) estimates that approximately (11) million people suffer a burn that necessitates medical attention each year, with 180,000 burn deaths occurring globally. The WHO considers burns to be the leading cause of morbidity, including disability, disfigurement, stigma, and rejection (WHO, 2018). Friction, cold, heat, radiation, chemical, or biological agents can all cause of burn. However, the majority of burn injuries are caused by heat from hot liquids, solids, or fire. Injuries are caused by burn coagulative destruction of the skin and are typically caused by thermal damage (Helen et al., 2017).

Injuries caused by Burn as cell death, which can oblige hospitalization and be fatal. It classified into three levels: First-degree burns only affect the skin's outer layer. They cause discomfort, redness, and swelling. Second-degree burns affect both the top and bottom layers of skin. They cause inflammation, pain, redness, swelling, and blistering. Partial thickness. Third-degree burns affect the skin's deep layers. Full thickness. They result in white or blackened, burnt skin. The skin could be numb (Stanojcic et al., 2018). Second-degree Burns are common and have a significant impact on the lives of those who are directly affected as well as those who are supporting them, whether sustained in childhood or adolescence (Almarghoub et al., 2020).

Because of the unique nature of their developmental, biological, and neurocognitive states during this life stage, adolescents have been identified as a subset of this population that is more vulnerable to psychosocial difficulties following burn injury (Dahl & Suleiman, 2017; Dumontheil, 2015). However, a traditional focus on biomechanical recovery after burn injury risks overlooking psychosocial difficulties, putting these adolescents at greater risk for social and psychological dysfunction (Dahl et al., 2016). Following a burn injury, biomechanical changes can result in a loss of independence and a compromise of feelings of autonomy, while altered body appearance can contribute to a loss of personal identity which needs rehabilitation during the recovery period (Zamanzadeh et al., 2015).

Rehabilitation can be defined as an active multidisciplinary program that improves the patient's physical, mental, and social states and prepares him or her for reintegration into society and routine life (Chen et al., 2012). As a result, the term burn rehabilitation refers to the process of enabling people with these disabilities to achieve their optimal level of physical, psychological, and social functioning and well-being by minimizing the negative effects of the injury in terms of maintaining range of motion, minimizing scarring and contracture development, maximizing functional ability, and improving overall aspects of quality of life (QOL) (Procter F 2010).

QOL is an expansive term with a multidimensional concept that includes both self-reported physical and mental health measures (Pan et al., 2015). It considers after medical treatments as a key parameter and a well-established evaluation to assess medical outcomes (Van et al., 2012). Consequently, the health team, particularly the nursing staff, should pay attention to various aspects of QOL dimensions during patient recovery, which may help to identify the affected domains early. Furthermore, early detection of the difficulties faced by burn patients during the rehabilitation process enables health care providers to plan targeted care that is initiated early and promotes continuity of care after hospital discharge to achieve the best results and prevent the onset of complications (Echevarría et al., 2012).

Nurses play critical roles as coordinators between the patient, his family, and other members of the rehabilitation team during these programs, as well as in the accurate assessment of the patient's condition from admission to discharge to minimize complications (Meirte et al., 2014; Rouzfarakh et al., 2021). Education can provide the patient with active and informed participation in resolving some of his/her problems (Hemmatpoor et al., 2018). Since nurses interact with patients more than other members of the treatment team, they are better equipped to communicate with advice, and educate patients, to raise awareness among patients (Mohammadi et al., 2012). Therefore, rehabilitation programs can serve in promoting a positive outcome on quality of life among adolescents with 2nd degree burn injury.

Significant of the study

WHO estimates that approximately 11 million people suffer a burn that necessitates medical attention each year, with 180,000 burn deaths occurring globally. WHO considers burns to be the leading cause of morbidity, including disability, disfigurement, stigma, and rejection, Egypt has one of the highest rates of burn-related deaths in the world, with approximately 250,000 people suffering from severe burns each year. Around 40% of these people die because they are not saved within the first six hours after being injured **(**WHO, 2018).

Because of the unique nature of their developmental, biological, and neurocognitive states during this life stage, adolescents have been identified as a subset of this population that is more vulnerable to psychosocial difficulties following burn injury. However, a traditional focus on biomechanical recovery after burn injury risks overlooking psychosocial difficulties, putting these

adolescents at greater risk for social and psychological dysfunction (Dahl et al., 2016).

Aims of the study

The aim of the study was to assess the effect of a rehabilitation program on quality of life of 2nd degree burn adolescents through:

- Assessing burn specific health score (BSHS) and health care needs of 2nd degree burn adolescents.
- Designing and conducting a rehabilitation program based on the pre-test BSHS and related health care needs.
- Evaluating the effect of a rehabilitation program on post-test quality of life of 2nd degree burn adolescents.
- Testing available correlation between different study variables.

Research Hypothesis

Conducting of a rehabilitation program would improve the quality of life of 2nd degree burn adolescents through improving their BSHS and decreasing related health care needs.

Subject and methods

Research Design: A quasi experimental design was utilized for conducting a one group pre-post-test study.
Setting: The study was conducted at the burn unit of plastic surgery department and follow up plastic surgery outpatient clinic at Ain Shams University Hospitals (El Demerdash), Cairo Governorate, Egypt.
Subjects: A purposive random sample was under this study. The sample size estimated based on Mohaddes Ardebili et al., 2019 and statistical power 90 %, level of confidence (1-Alpha Error): 95 %, Alpha 0.05, Beta 0.1 and using STSTS [16] **(Ststs Corp, College Station, Texas, USA)** by using the following equation:

$$N = \frac{N \times p\,(1-p)}{\{N-1 \times (d^2 \div z^2)\} + p\,(1-P)}$$

N x p (1-p)	= (135*(0.5*(1-0.5)
N-1	= (135-1)*
d^2/z^2	= 0.0025 / 2.8561
P (1-p)	= 0.5*(1-0.5)
N	= 100.3 = 100

N = Community size / Month
Z = Class standard corresponding to the level of significance equal to 0.95 and 1.96
d = the error rate is equal to 0.05
p = Ratio provides a neutral property = 0.50
Based on the equation, the sample size was 100 adolescents. The sample participants were selected through the following ***inclusion criteria***:

- Age was 12–18 years old.
- Having 2nd degree burn happened at least 2 months ago or more.
- Only accidental burn due to flame, electrical issue, scald, chemicals etc...
- With superficial, deep or/and mixed burn thickness.
- After grafting and preparing for discharging plan within maximum two days.
- Acceptance to be a study participant.

The ***exclusion criteria*** were homicidal/suicidal burn because their psychological and emotional status would affect their cognition to determine the health care needs and Burn Specific Health Scores (BSHS-B) which needed to designing and conducting the rehabilitation.

Technical Design

It was designed by the researcher after reviewing the related literature in the light of relevant studies in relation to the following interviewing tools:

First tool:

Part (1): Characteristics of the studied adolescents such as age, gender, residence, education level and family structure.

Part (2): Medical data of the studied adolescents such as burn reason, severity, site, associated illness and history of previous hospitalization.

Second tool: Pre-post **Burn Specific Health Scores-Brief (BSHS-B) assessment**: This scale was adopted from *Pishnamazi et al., 2013* and used to assess the adolescents' functioning through three domains (physical, social & emotional and non-physical/burn specific) through 33 items. ***Physical Domain*** included hand functioning activities such as writing, eating, tying shoelaces (5 items) and simple abilities as ability to bathe, dress, sit on chair (3 items). **Social and *Emotional Domain*** included affect emotions such as loneliness, sadness, inadequate social communication (7 items), interpersonal relationships communications as problems with family, distance from family (4 items) and body image as impaired self-image from scars or unattractiveness from others (4 items). ***Non-physical/burn Specific Domain*** included heat sensitivity problems such as sun exposure, hot weather, skin sensitivity (5 items) and treatment regimens as troubles with skin care, treatment procedures, time allocation (5 items).

Scoring system: Responses for each item was scored as (Never=0), (Sometimes=1) and (Always=2). Scored items were summed up and converting into percentage to calculate the total. High score meant high function.

Third tool: Pre-post **burn patients' health care needs assessment**, adopted from *Liang C.Y. et al, 2011.* It was a 4-point Likert scale containing 31 items assessing the burn adolescents' health care needs through both of physiological and psychosocial needs.

Scoring system: Responses of items were (no need at all=1; need somewhat=2; need moderately=3 and need very much=4) to determine the physiological and psychosocial items they needed during the past week. For calculating the total score, needed items were summed up and converting into a percentage to be categorized into:

- Low needs <50%.
- Average needs 50-70%.
- High needs >70%.

Fourth tool: Pre-post Children's Dermatology Life Quality Index (CDLQI) text version, adopted from *Parrish C. et al, 2019*. It was a 4-points Likert scale containing 10 items to assess the domains of QOL impairments among adolescents with burn or other dermatological conditions. QOL domains included physical symptoms (as pain, itching), negative emotions (as embarrassment, sadness), friendship relations, clothing, sports/physical activities, playing, school, intrusive social attention/ bullying, sleeping pattern and treatment coping.
Scoring system: Responses of each item were (not at all=0; only a little=1; quite a lot =2 and need very much=4). The higher scores the more impaired QOL. The QOL total score was summed up and converted into a percent to:

- Impaired QOL: less than 50% (0-13 items)
- Average QOL: 50-70 (14-22 items)
- Good QOL: more than 70% (more than 22 items)

Content validity: A group of seven experts in the community health nursing (2 experts), pediatric nursing (2experts), Pediatric medicine (2experts) and plastic surgery (1expert) ascertained the content's validity; their opinions were elicited regarding the format, layout, consistency, accuracy and relevancy of the tools. Also, they revised the contents of the rehabilitation program.

Reliability: The internal consistency reliability (Cronbach's α) for Burn Specific Health Scores-Brief (BSHS-B) was (0.920), overall health-care needs (0.96) and Children's Dermatology Life Quality Index (CDLQI) (0.911) as excellent.

Ethical considerations

The study proposal was examined then approved under the formal approval number (FAN/21/2021) by the Faculty of Nursing's Research Ethical Committee at Modern University for Technology and Information (MTI) - Egypt. Consent was obtained from each adolescent before participation. The purpose of the study was explained in written words in the introduction part of the session. In addition, participants who agreed to participate in the study were assured that all information obtained would be kept confidential and there were no personal identifiers in the questionnaire. They were notified that they had the right to withdraw from the study at any time.

Statistical design

The collected data was coded and entered into the statistical package for social sciences (SPSS) (SPSS Inc; version 24; IBM Corp., Armonk, NY, USA). After completing entry, the data was explored to detect any errors. Then, it was analyzed by the same program for presenting frequency tables with percentages. Qualitative data was presented as a number and percent. Furthermore, quantitative data was described as mean/standard deviation as appropriate. The Chi-square probability distribution is particularly useful in analyzing categorical variables. Pearson Correlation coefficients was used to measure the strength of the linear relationship between variables. Also using of Ordinal logistic regression model was for assessing factors that affected the ordinary dependent variable. The results were considered statistically significant at $P < 0.05$ and highly significant

at P < 0.01**. T test was used for comparison between mean score pre and post intervention.

Operational Design

Preparatory Phase: A literature review was written based on available literature (recent/past). It helped the researchers in more awareness by the real magnitude and dimensions of burn adolescents' QOL issues in Egypt and worldwide. Also, it helped in formulating tools of data collection and rehabilitation program contents.
Pilot Study: It was conducted on a group of 10 adolescents (10% of total sample). It was conducted prior to data collection to assess feasibility and duration of data collection. No modifications were done, therefore the participants in pilot study were included in the study.
Field Work: Data collection was done over eight months from February 2021 to September 2021. Pre-test data collection was done within one month. The rehabilitation program was designed through one month then implemented within one month. Three months' duration after the program finishing then the post-test data collection was done within two months.

Program construction:
The burn adolescents' rehabilitation program was conducted within the following phases:
Assessment phase: Based on the pre-test assessment of the adolescents' BSHS and health care needs, researchers prepared and designed the rehabilitation program. The main objective of the study was to assess the effect of a rehabilitation program on the QOL of 2nd degree burn adolescents. The researchers explained the aim of the study and the components of the tools to the studied adolescents during interview at the outpatients.
Implementation phase: The rehabilitation program was designed by the researchers after reviewing the literature to care for adolescents with 2nd degree burn and rehabilitation of them. The program was designed based on the pre-assessment data results (pre-test) regarding BSHS and health care needs. All the study participants (100 burn adolescents) were attended the program sessions. The rehabilitation program was completely implemented at the follow up plastic surgery outpatient clinic at Ain Shams University Hospitals (El Demerdash). Researchers divided the studied adolescents into groups, each group involved 10-15 adolescents according to their case similarity in burn site, severity, associated illnesses and health care needs. The adolescents were notified about the time of sessions using available mobile phone calls, SMS and/or a WhatsApp groups. The program sessions were in the form of lectures, seminars, demonstration using power point slide show and WhatsApp notifications.
Producing the program content: The content was prepared and designed through one month based on the latest guidelines and in collaboration with the department rehabilitation team consisted of medical, surgical and physiotherapy specialists in the field of rehabilitation education for burn victims. The content was in form of educational texts, photos and videos based on adolescents' BSHS and health care needs. Adolescents have been trained in three sessions.
Program Intervention: The rehabilitation program was completely carried out over one month within three sessions with 30-45 min. duration for each session based on their ability and endurance. The program was conducted in groups for

each session as mentioned. To ensure that the adolescents performed the program at home properly, researchers provided them by images and short videos that illustrated performing the rehabilitation activities (exercises, range of motion & body mechanics). In addition to following them up through phone calls and/or a WhatsApp groups. The program sessions' contents were as the following:

First Session: (introductory session) orientation and explanation of the rehabilitation program objectives and give an explanation about skin function and cause, degree and types of burn.

Second Session: An explanation and demonstration for first aids of burn for prevention of complication, personal hygiene, and wound care (performing dressing, type of dressing, range of motion and body mechanics to help in activities of daily living). Return to normal daily activities such as attending school, should be encouraged, and supported by return-to-school visiting programs. Counselling for adolescents and their families about the importance of therapeutic and educational group work programs to facilitate psychosocial adjustment and promote a positive community understanding of their disability/handicaps. Also counselling for supportive groups which have shown efficacy in promoting emotional recovery. In addition to group psychotherapy sessions in burn camps appear to positively support emotional responses post-burn, including self-esteem and social integration.

Third Session: Re-demonstration for wound dressing, daily physical activities, cough and lips exercises, upper arm exercises, arm exercises, neck joint exercises, leg exercises and abdomen exercises. Range of motion and body mechanics also were re-demonstrated. Then the researchers summarized the program, ask adolescents for any questions, feedback and open discussion.

Evaluation phase: Asking adolescents to complete the same tools for post assessment. It was after the rehabilitation program conducting by 3 months. This post-test was aimed to evaluate the effect of the program on burn adolescents' QOL.

Results

Table 1: Shows that the mean age of adolescents was 14.99±2.48 years, 61% of them were females and 57% were living in urban areas. Also, 60% of them enrolled at preparatory school. Regarding burn data, 32% of them had burn because of hot fluids and 78% of burns were moderate as in severity classification. In addition to 74% of burns site were lateral. As for medical history, 18% of adolescents suffered from associated illnesses with 13% of previous hospitalization.

Table 2: Reported an improving in the posttest mean score of adolescents' physical domain through hand functioning activities and simple abilities by 6.80±2.3 and 9.85±2.9. In addition to positive improving in posttest mean score of social and emotional domain through affected emotions, interpersonal relationships communications and body image to be 17.6±4.5, 9.3±3.1 and 8.22±2.0. Also, there was improvement in both heat sensitivity problems and treatment regimens of the non-physical/burn specific domain by 9.74±2.9 and 11.20±3.3 through the posttest. Furthermore, improving of the posttest total mean score of BSHS-B by 75.26±18.6.

Table 3: Reflects a noticed improvement in the adolescents' posttest psychological and physiological needs which decreased the high needs to 10% and 12%. Also, the mean score of total health care needs decreased from 78.11±4.38 to 39.25±3.79 after conduction of the rehabilitation program.

Table 4: Reveals the adolescents' QOL items development related to schoolwork, bullying and sports by 66% after conduction of the rehabilitation program. Also, posttest sleeping pattern, doing hobbies, physical symptoms and negative emotions items had a positive improvement by 61%, 60%, 56% & 53% at p value < 0.01 for all QOL items.

Figure 1: Indicates that adolescents' good QOL improved at the posttest to reach 61% while it was 31% through the pretest.

Table 5: This ordinal logistic regression model approved a highly significant correlation between adolescents' total CDLQI and their age, educational grade, burn severity & burn site through the post-test at p=0.001. The model also shows that these socio-demographic and medical variables explained about 82.6% of the improving factors of post-test total CDLQI level of the adolescents after implementation of the rehabilitation program.

Table 6: States a high statistical correlation between adolescents' total CDLQI, health needs and BSHS-B after implementation of the rehabilitation program (r=.701 & r=971), as well as a high correlation between total CDLQI and health needs (r=.966).

Table 1: Distribution of the 2nd degree burn adolescents according to socio-demographic characteristics and medical data (n=100)

Socio-demographic data	**N**	**%**
Age (years):		
13-15	67	67
16-18	33	33
Mean±SD	14.99±2.48	
Gender:		
- Male	39	39
- Female	61	61
Educational level:		
- Preparatory school	60	60
- Secondary school	40	40
Residence:		
- Rural	43	43
- Urban	57	57
Family Structure:		
- Nuclear	36	36
- Extended	64	64
Medical Data		
Burn Reason:		
- Flams	29	29
- Hot fluid	32	32
- Chemical	30	30
- Others	7	7
Burn Severity:		

- Mild - Moderate - Severe	10 78 12	10 78 12
Burn Site: - Bilateral - Lateral	 26 74	 26 74
Associated Illnesses:	18	18
History of Hospital Admission:	13	13

Table 2: Pre-test Post-test mean score comparison of adolescents according to Burn Specific Health Scores-Brief (BSHS-B) (n=100)

Items	**Pre**	**Post**	**T**	**P**
	Mean (SD)	**Mean (SD)**		
Physical Domain:				
Hand Functioning Activities: (writing, eating and tying shoelaces)	3.76 (1.1)	6.80 (2.3)	10.116	<0.01**
Simple Abilities: (Ability to bathe, dress and sit on chair)	7.2 (1.1)	9.85 (2.9)	12.700	<0.01**
Social and Emotional Domain:				
Affected Emotions: (loneliness, sadness and inadequate social communication)	9.5 (2.9)	17.6 (4.5)	8.795	<0.01**
Interpersonal Relationship Communications: (problems with family and distance from family)	5.6 (1.9)	9.3 (3.1)	12.900	<0.01**
Body Image: (impaired self-image from scars or unattractiveness from others)	4.98 (1.6)	8.22 (2.0)	10.444	<0.01**
Non-physical/burn specific Domain:				
Heat Sensitivity Problems: (sun exposure, hot weather and skin sensitivity)	6.02 (2.8)	9.74 (2.9)	8.200	<0.01**
Treatment Regimens: (troubles with skin care, treatment procedures and time allocation)	7.4 (1.1)	11.20 (3.3)	9.101	<0.01**
Total scale	**44.29 (7.33)**	**75.26 (18.6)**	**14.560**	**<0.01****

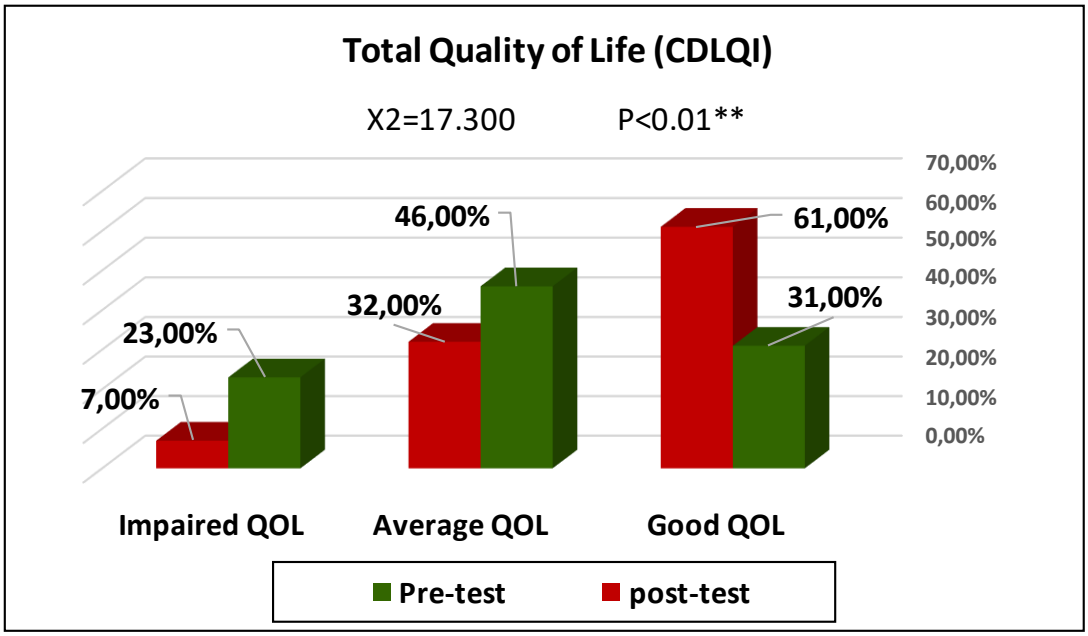
Paired Sample t-test (high significant p<0.01)

Table 3: Comparison of adolescents' pre-test post-test regarding health care needs (n=100):

Health care needs classification	Pre-test	Post-test	X2	P
	N (%)	N (%)		
Physiological care needs:				
- Low needs	13 (13)	66 (66)	16.835	<0.01**
- Average needs	17 (17)	22 (22)		
- High needs	70 (70)	12 (12)		
Psychosocial care needs:				
- Low needs	7 (7)	69 (69)	18.604	<0.01**
- Average needs	18 (18)	21 (21)		
- High needs	75 (75)	10 (10)		
Total health care needs:	**Mean±SD** 78.11±4.38	**Mean±SD** 39.25±3.79	**T** 16.139	**P** <0.01**

Table 4: Comparison of adolescents' pre-test post-test according to their Quality of Life (CDLQI) (n=100)

Children Dermatology Life Quality Index (CDLQI)	Pre-test (%)				Post-test (%)				X2	P
	0	1	2	3	0	1	2	3		
Physical symptoms: Itchy, scratchy, sore or painful.	6	31	48	15	10	56	30	4	11.201	<0.01**
Negative emotions: Embarrassed, self-conscious, upset or sad.	0	30	47	23	15	53	27	5	9.482	<0.01**
Friendship relations.	8	30	45	17	31	40	27	2	8.761	<0.01**
Different or special clothes/shoes.	6	12	50	32	9	40	42	9	10.801	<0.01**
Going out, playing, or doing hobbies.	7	20	40	33	11	60	20	9	12.006	<0.01**
Swimming or other sports.	3	24	43	30	10	66	17	7	8.982	<0.01**
School work or holiday.	5	18	45	32	11	66	15	8	10.921	<0.01**
Calling you names, teasing, bullying, asking questions, or avoiding you.	11	16	47	26	20	66	7	7	14.223	<0.01**
Sleep pattern.	7	12	51	30	10	61	20	9	13.027	<0.01**
Coping with treatment.	4	11	68	17	14	50	30	6	11.604	<0.01**
(0 = Not at all, 1 = Only a little, 2 = Quite a lot, 3 = Very much)										



Chi-square test

Figure 1: Pre-test post-test adolescents' total quality of life (CDLQI) (n=100):

Table 5: Correlation between adolescents' post-test total quality of life level and socio-demographic & medical data

Parameter Estimates		Estimate	Std. Error	Wald	df	Sig.	95% Confidence Interval		r-square
							Lower Bound	Upper Bound	
Threshold	[Post-test CDLQI=1]	54.712	13.639	11.605	1	.000	24.112	82.356	
	[Post-test CDLQI =2]	61.560			1	.000	29.606	93.415	
Location	Age	.511	12.886	12.763	1	.000	.252	.771	
	Gender	2.971			1	.031	.312	5.672	
	Educational grade	5.602	.138	14.953	1	.000	2.913	8.296	82.6
	Residence	-1.686-	1.358		1	.276	-4.508-	1.112	
	Burn severity	11.277	1.408	4.791	1	.000	4.702	16.604	
	Burn site	5.647	1.488	16.181	1	.000	3.148	7.227	
	Associated illnesses	-1.892-	2.956		1	.081	-4.002-	.263	
			1.346	1.501					
			1.101	12.964					
				13.122					
				3.094					

Ordinal logistic regression model

Table 6: Post-test correlation between adolescents' total burn specific health scores-brief (BSHS-B), quality of life (CDLQI) and health care needs

Pearson correlation coefficient						
	Total BSHS-B		Total CDLQI		Total Needs	
	r	p	r	p	r	P
Total BSHS-B			.701**	.000		
Total CDLQI					.966**	.000
Total Needs	.971**	.000				

(**) Correlation is significant at the 0.01 level.

Discussion

Burn rehabilitation is definitely difficult and time-consuming exertion, in order to achieve the goal of optimal long-term function, must begin at the beginning of burn care. It will be achieved through establishing a work-hardening multidisciplinary rehabilitation program for adolescents to meet their needs and improve quality of life *(Robert L Sheridan et al., 2021)*. The results of current study could fundamentally rehabilitate burned adolescents physically and psychosocially in order to improve their coping abilities with the new health condition.

Regarding characteristics of studied adolescents, the result of present study showed that mean age of them was 14.99±2.48 years with more than half females (Table 1). This results were agreeing with the result of *Shrestha & Gurung,2018*, on secondary school students from 16-18 years old in Nepal. They reported that more than half of their study participants were females.

The current study revealed that more than three quartets of studied adolescents had a moderate classified burn. This result is going with Kawalec & Pawlas, 2020's study which conducted on hospitalized under 18 years old children at Polish hospitals. Their studied urban and non-urban children had moderate burn by near half of them.

Concerning medical data of the studied adolescents, the current study mentioned that one third of studied adolescents suffered from hot fluid burn and more than three quartets had lateral moderate burn. In addition to less than one fifth suffered from associated illnesses with previous hospitalization (Table 1). These results cohort with the study of Griffiths et al., 2021 who detected that more than half of participants suffered from lateral burn injury. Also, it regulars with the study conducted in Nepal by Shrestha & Gurung, 2018 who concluded that the highest cause of burn among studied children was hot fluids burn.

With regard to the adolescents' BSHS, there was an improvement in post-test mean score of all domains (Table 2). Physical domain improved in hand functioning activities and simple abilities by 6.80±2.3 and 9.85±2.9. This noticed improvement in some of activates and abilities was related to fitness and muscles' flexibility of this age group. Social and emotional domain also improved through affected emotions and interpersonal relationships communications 17.6±4.5 and 9.3±3.1. Additionally, non-physical/burn specific domain improved by 9.74±2.9

and 11.20±3.3. Furthermore, improving of the posttest total mean score of BSHS-B by 75.26±18.6 with high significant difference for all domains and total score. Those great results reflected the effect of the conducted rehabilitation program that positively changed their social and emotional status which are usually disturbed in that age because of many related physiological changes as hormonal curve. Those results were supported by the study of Spronk et al.,2019 which conducted in Netherlands were agreeing with the current results that more than half of study sample had different health problems associated with burn.

Regarding the obvious improvement in the adolescents' posttest psychosocial and physiological needs (Table 3) which decreased the high needs to tenth and almost above tenth. Also, the mean score of total health care needs decreased from 78.11±4.38 to 39.25±3.79 after conduction of the rehabilitation program with a highly statistical significance respectively ($P<0.01$), which indicate the effectiveness of the rehabilitation program. These current study findings were in contrast with Liang et al., 2012 who conducted research about predictors of healthcare needs in discharged burn patients in Taiwan, which reported that the most common problems were skin-related, and they were the worst current health problems following a severe burn. To put it another way, skin care is a critical care requirement for newly discharged burn patients. As a result, when burn patients are hospitalized, health-care professionals should provide more education about wound and healed skin management. The study also discovered that common psychosocial needs included the restoration of QOL, financial assistance, and the availability of someone with whom to discuss further problems.

The current study revealed the adolescents' QOL (Table 4) items development related to schoolwork, bullying and sports by two third of the total sample after conduction of the rehabilitation program. Also, posttest sleeping pattern, doing hobbies, physical symptoms and negative emotions items had a positive improvement by almost two third, two third, above the half & almost half at p value < 0.01 for all quality-of-life items. This agreed with Shahid et al., 2018 his study was about Assessment of quality of life in post burn survivors: A cross-sectional single-center first validation study from Pakistan he reported that reported around half of the sample has moderate problem in mobility followed by self-care. Most of the participants were reported about two third of moderate pain/discomfort. And above half of the sample observed moderate anxiety/depression.

The present study Indicates (figure 1) that adolescents' good quality of life improved at the posttest to reach about two third of the total sample while it was around less than one third through the pretest with respectively $p<0.01$. The current study agreed with Masood et al. (2016) who conducted research about gender differences in resilience and psychological distress of patients with burns. discovered that developing and implementing a rehabilitation programed for the

burned population would aid them in effectively coping with burns. Another supported study by Paratz et al. (2012) who did research of intensive exercise after thermal injury improves physical, functional, and psychological outcomes. confirmed that a physiotherapy educational program for patients with hand burns improved physical and functional outcomes while also having a positive effect on psychological outcomes.

Results of the current study reported a highly significant correlation between adolescents' total quality of life and their age, educational grade, burn severity & burn site through the post-test. The logistic regression model also shows that these sociodemographic and medical data explained about 82.6% of factors that improving the post-test total quality of life (Table 5). Sociodemographic data could affect negatively on the adolescents living environmental conditions which followed effect on their QOL. Also, medical data could limit their abilities and activities to be a chance of deteriorating daily life activities and psychological status.

Those findings were slightly in line of the cross-sectional study of Nigusie S. T. et al., 2021 in Amhara Regional State in Ethiopia which stated that survivors' medical data as affected body parts and related comorbidities were considered as factors of QOL. While personal data as sex and residence had no effect on the participants' QOL.

These study findings stated a substantial correlation between adolescents' total CDLQI, health needs and burn specific health scores-brief after implementation of the rehabilitation program, as well as a high correlation between total CDLQI and health needs (Table 6). Those finding reflected the base relation between health problems and health needs. All adolescents in general have special needs especially related to their psychosocial conditions. Presence of added problems related to their second stage burn created wide extent to their needs to enable them overcoming those problems which are logically associated with the level of their QOL and can affect it.

Finally, the researchers' efforts in conducting the nursing rehabilitation program to clarify its effect on the studied adolescents' health needs and related QOL, based on the findings of the current study. This explains the importance of discharge rehabilitation programs in follow up clinics and at homes.

Conclusion

The present study highlighted the significant improvement in 61% of the burn adolescents' QOL after conduction of the rehabilitation program. This improvement in adolescents' QOL was based on the positive change in the total mean score of their BSHS (75.26±18.6) and decreasing of their health care needs to (39.25±3.79). Studied adolescents' BSHS-B, health care needs and QOL reported a strong positive high correlation.

Recommendations

Effective educational programs for burn assigned nurses and other members of the multidisciplinary rehabilitation team. Creating rehabilitation programs according to the burn stage and clinical course for all patients before discharge. Also, a structured home-based rehabilitation programs should be conducted.

Limitations of the Study: No limitations.

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