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Scar Status, Depression, Sleep, and Health Related Quality of Life Following Severe Burn Injury: A Cross-sectional Descriptive Study*

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Introduction

Severe burn patients experience tremendous physical and psychosocial difficulties. As mortality rates have decreased, and disability and appearance changes are continuing issues, Health Related Quality of Life (HRQoL) is considered a significant clinical outcome measure of burn injury [1,2].

Previous research reported that severity of full-thickness burns and wide percentage of total body surface area (%TBSA) have a negative influence on HRQoL [1,2]. In addition, site of burn injury, especially upper limb (hand deformity) burns were associated with decreased reported HRQoL [2]. The older age and female gender [3] demonstrated similar relationships with HRQoL for severe burn patients. Subjective perceptions of scar assessment has been emphasized as an outcome measure of burn treatments [4]. Survivors of severe burn injuries have diverse difficulties resulting from the scarring process, and subjective features of scar status such as pain, itching, and appearance may be a mediating factor of burn-specific HRQoL [1,4-6]. The subjective perception of scar mediated the relationship between level of burn severity and HRQoL [6].

In addition, psychological symptoms have negative impacts on rehabilitation and return to social activities, and these effects may worsen after discharge from hospital [7]. In literature, psychological difficulties, including depression and posttraumatic stress symptoms were strong predictors for HRQoL [8]. Depressive symptoms tend to be lower immediately after discharge, while one year later they tend to increase substantially [9,10]. Psychosocial difficulties have been suggested as the major barrier of return to work [11]. Depressive symptoms and sleep problems might be caused by burn related physical symptoms, while some patients with psychological problems might evaluate their HRQoL as worse condition [8].

The impact and trends of physical problems and scar status on HRQoL has been widely studied, but psychological issues and their relationships with HRQoL have been less investigated among severe burn patients after discharge [7]. The purposes of this study are to 1) investigate burn-specific HRQoL and burn scar status in relation to burn-related characteristics, 2) to identify differences in HRQoL related to sleep disorders and depression, and 3) to identify the factors that influence HRQoL for severe burn patients.

주요어 : 화상, 삶의 질, 우울, 수면, 피부상태
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Method

Study design

This research project was intended to develop interventions to support and strengthen adaptation for severe burn patients following their discharge from hospital. This project is based on a holistic approach to problem identification, prevention, and early intervention. A comprehensive longitudinal study designed to understand the physical and psychosocial changes for severe burn patients in South Korea is currently underway. This analysis is based on the preliminary data from a study cohort.

Sample and data collection method

A convenience sample of severely burned patients was recruited from a major burn care center located in Seoul, South Korea. Participants were eligible for this study if they were: (1) adults over 18 years old, (2) admitted to the major burn center with initial burns more than partial-thickness burn or over 5% of total body surface area, and (3) were clinically stable and did not have cognitive problems. Potential participants were approached by trained research assistants once they had a discharge plan. They were informed about the purpose of the research, longitudinal design, and were assured that their participation would be voluntary and anonymous, and written informed consent from the participants were obtained. A prior power analysis using G* power 3.1 indicated that at least 118 subjects would be required to detect a medium effect size (f^2) of 0.15, with 80% of power, two-sided α of 0.05, and 10 potential predictors. Of the 150 participants who completed the questionnaire, 5 had an excess of missing data for several study variables and were excluded. Thus, there was a final sample of 145 participants included in this analyses.

Measurements

● Demographics and burn-related characteristics

Self-reported demographic characteristics were collected and included gender, age, level of education, marital status, and whether the participant had a cohabitee. Burn-related characteristics included cause of burn, burn severity (degree and range), visible scar (yes or no), face and joint involvement, the most difficult issues dealt with based on medical records coded by a research assistant.

● Scar assessment

A subjective patient scar assessment scale was used to assess the participants' perceptions of their scar status [4]. This scale consists of six items measuring the status of pain, itching, scar color, pliability, thickness, and irritability of the burn scar. Each item is scored on a scale ranging from 1–10 with a score of 1 indicating normal skin features and a score of 10 indicating the worst imaginable scar feature. Higher scores reflect self-perceived poor scar status. The Cronbach's alpha was 0.91.

● Health-related Quality of life (HRQoL)

We used the culture-specific and burn-specific 40-item health-related quality of life-brief-Korean (BSHS-B-K) scale [12] to assess burn-specific HRQoL. This scale consists of nine subscales: simple abilities (3 items), heat sensitivity (5 items), hand function (5 items), treatment regimen (5 items), work (4 items), body image (4 items), affect (7 items), interpersonal relationships (4 items), and sexuality (3 items). Each item is rated on a 5-point Likert scale ranging from 0 (the best) to 4 (the worst). Higher scores indicate worse HRQoL. The alpha coefficients was 0.94 in a recent Korean study [6]; the alpha coefficient for the current study was 0.96.

● Sleep disorders

Sleep disorders were measured by the 8-item Athens Insomnia Scale (AIS-8) which is validated as an effective diagnostic tool based on the International Classification of Diseases-10 (ICD-10) [13,14]. The AIS-8 assesses sleep induction, awakenings during the night, final awakening, total sleep duration, sleep quality, well-being, functioning capacity, and sleepiness during the day. Each item was rated on a 4-point Likert scale ranging from 0 (no problem at all) to 3 (very serious problem). The participants were requested to evaluate if they had experienced the sleep difficulty at least three times a week during the last week. Cronbach's alpha was 0.89.

● Depression

Depression was measured by 9-item Korean version of the Patient Health Questionnaire (PHQ-9) based on the diagnosis of DSM-IV depressive disorders [15-17]. Each item is rated on a scale of 0 to 3, and total scores range between 0 and 27.

The PHQ-9 is useful to detect depression and measure the

severity of depressive symptoms, and a score of 5 is recommended as the optimal cutoff for depressive disorders in Korea [17]. Cronbach's alpha was 0.93.

Statistical analysis

Statistical analyses were performed using IBM SPSS 22.0 (SPSS, Inc., Chicago, IL, USA). Demographics and burn-related characteristics, levels of HRQoL, and scar status are presented as descriptive statistics. Bivariate analyses (i.e., *t*-tests, analyses of variance, and correlations) were conducted to examine the relationship between the dependent variable (HRQoL total score) and the independent variables (scar status, depression, sleep, burn-related characteristics). Significant variables in the bivariate analyses (p<.05) were entered into the multiple linear regression. Multicollinearity was examined using correlation coefficients (<0.8), variance inflation factors (<10), and tolerances (>0.1). We performed two multiple linear regression analyses to test the effects of burn-related characteristics, scar status, depression, and sleep on the HRQoL. The first model regressed burn-related characteristics on HRQoL, and the second model regressed burn-related characteristics, scar status and psychological factors (depression and sleep) on HRQoL.

Ethical aspects

This study was approved by the Institutional Review Board of G University and the H burn center (IRB #1044396-201705-HR-081-02 & IRB #2018-014).

Results

The demographic and burn-related characteristics and their relationship to HRQoL and scar status are presented in Table 1. Three-quarters of the participants were men, and participants' average age was 38.41 years. The most common cause of the burn was flame (37.2%), followed by scalds (24.1%), electricity (22.1%), and contact (10.3%). About 57% were reported to have

〈Table 1〉 Subjects' Characteristics by HRQoL and Scar Assessment (N=145)

Characteristics	n (%) or Mean±SD		HRQoL	t or F or r (p)	Scar status	t or F or r (p)
Gender	Men	109 (75.2)	2.25±0.85	-0.76 (.446)	33.99±14.11	-0.69 (.490)
	Women	36 (24.8)	2.37±0.80		35.83±13.06	
Age (year)		38.41 ±11.86	-	.11 (.210)	-	.13 (.123)
Education	College or above	57 (39.3)	2.22±0.81	0.75 (.457)	33.40±13.11	0.73 (.466)
	High school or less	88 (60.7)	2.32±0.85		35.13±14.32	
Marital status	Married	68 (47.2)	2.37±0.86	-1.24 (.216)	36.09±14.24	-1.45 (.150)
	Single	77 (52.8)	2.20±0.81		32.76±13.33	
Having a cohabitee	Yes	99 (68.3)	2.22±0.84	1.33 (.187)	33.14±13.78	1.68 (.095)
	No	46 (31.7)	2.41±0.83		37.26±13.70	
Cause of burns	Scalds	35 (24.1)	2.24±0.94	1.42 (.240)	30.49±14.91	1.70 (.169)
	Flame	54 (37.2)	2.27±0.89		35.09±13.68	
	Electrical	32 (22.1)	2.51±0.66		37.94±11.87	
	Contact	15 (10.3)	2.05±0.74		34.13±14.39	
Burn degree†	4	83 (57.2)	2.52±0.81	-4.25 (<.001)	38.19±12.86	-3.96 (<.001)
	< 4	62 (42.8)	1.96±0.76		29.44±13.61	
Burn range (%)		15.97 ±17.92	-	.31 (<.001)	-	.31 (<.001)
Visible scar	Yes	138 (95.2)	2.29±0.83	-0.33 (.740)	34.59±13.78	-0.53 (.594)
	No	7 (4.8)	2.18±0.94		31.71±15.93	
Joint involvement	Yes	115 (79.3)	2.40±0.81	-3.39 (.001)	36.68±12.89	-3.99 (<.001)
	No	30 (20.7)	1.84±0.80		25.90±14.24	
Most difficult issue	Pain and discomfort	49 (33.8)	2.34±0.79	3.36 (.021)	35.73±13.83	4.63 (.004)
	Economic issue	44 (30.3)	2.32±0.81		34.07±13.68	
	Emotional distress	26 (17.9)	2.53±0.82		40.27±12.10	
	Others	26 (17.9)	1.85±0.88		26.85±12.99	
Skin rehabilitation	Yes	128 (88.3)	2.30±0.85	-0.73 (.469)	35.05±13.90	-1.45 (.148)
	No	17 (11.7)	2.14±0.69		29.89±12.87	

HRQoL=health-related quality of life; ICU= intensive care unit; † N=144.

fourth-degree burns, and 95.2% of the subjects had visible scars. The average burn range was 16.0%, and 79.3% were burned on a joint. The most difficult issue the participants reported was pain and discomfort (33.8%), followed by economic difficulty (30.3%), and emotional distress (17.9%). About 40% were admitted to the intensive care unit for burn care during their hospitalization.

The overall mean of HRQoL and the patient scar assessment score were 2.28 out of 5 and 34.45 out of 60, respectively. Participants with higher burn degree, joint involved burns, and emotional distress, reported significantly lower burn specific HRQoL and poorer scar status than their counterparts (Table 1).

Table 2 shows differences in burn-specific HRQoL by sleep disorder. Those with sleep disorder reported lower overall HRQoL as well as lower HRQoL on each of the nine subdomains. Among the nine subdomains of the burn-specific HRQoL, the work score was the highest among those with sleep disorder followed by treatment regimen and heat sensitivity scores. On the other hand, the treatment regimen score was the highest among those without sleep disorder followed by the scores for work and simple abilities.

Differences in HRQoL by levels of depression are summarized in Table 3. About 57% of participants were classified as depressive. Those participants classified as depressive reported significantly lower levels of HRQoL for all of the nine subdomains of the burn-specific HRQoL scale.

To identify factors predictive of the burn-specific HRQoL, we performed hierarchical multiple regression analyses using those potential predictors that were found in the previous bivariate analysis to be significantly related to HRQoL (Table 4). Burn-related factors including burn degree, burn range, and joint involvement were entered into the first model. At this stage, all burn-related variables included were found to be significant predictors of HRQoL, accounting for 19% of the variance in HRQoL. Next, scar status, level of depression and sleep disturbances were added to the model. Poor scar status, higher

〈Table 2〉 Differences in Levels of HRQoL by Sleep Disorder (N=145)

Characteristics	Sleep disorder		t (*p*)
	No (n=46)	Yes (n=99)	
Burn-specific HRQoL	1.69 ± 0.61	2.55 ± 0.79	-7.26 (<.001)
Simple abilities	2.04 ± 1.25	2.52 ± 1.10	-2.30 (.023)
Heat sensitivity	1.90 ± 0.84	3.00 ± 1.20	-6.36 (<.001)
Hand function	1.52 ± 1.00	2.12 ± 1.05	-3.22 (.002)
Treatment regimen	2.19 ± 1.05	3.07 ± 1.07	-4.67 (<.001)
Work	2.09 ± 1.28	3.44 ± 1.25	-6.03 (<.001)
Body image	1.70 ± 0.95	2.73 ± 1.18	-5.62 (<.001)
Affect	1.38 ± 0.51	2.24 ± 1.00	-6.87 (<.001)
Interpersonal relationships	1.22 ± 0.53	1.80 ± 0.99	-4.59 (<.001)
Sexuality	1.23 ± 0.51	2.04 ± 1.12	-5.99 (<.001)

HRQoL=health-related quality of life.

〈Table 3〉 Differences in Levels of HRQoL by Depression (N=145)

Characteristics	Depression		t (*p*)
	No (n=62)	Yes (n=83)	
Burn-specific HRQoL	1.66 ± 0.52	2.74 ± 0.72	-10.54 (<.001)
Simple abilities	1.98 ± 1.07	2.65 ± 1.16	-3.59 (<.001)
Heat sensitivity	1.93 ± 0.94	3.18 ± 1.11	-7.19 (<.001)
Hand function	1.50 ± 0.87	2.25 ± 1.10	-4.58 (<.001)
Treatment regimen	2.09 ± 0.95	3.32 ± 0.97	-7.62 (<.001)
Work	2.12 ± 1.14	3.68 ± 1.20	-7.93 (<.001)
Body image	1.67 ± 0.79	2.96 ± 1.18	-7.85 (<.001)
Affect	1.31 ± 0.45	2.46 ± 0.95	-9.68 (<.001)
Interpersonal relationships	1.17 ± 0.47	1.95 ± 1.01	-6.15 (<.001)
Sexuality	1.28 ± 0.49	2.16 ± 1.17	-6.11 (<.001)

HRQoL=health-related quality of life.

levels of depression and the sleep disturbances were associated with significantly lowered HRQoL and accounted for an additional 75% of the variance in HRQoL.

Discussion

The aim of this study was to examine the level of HRQoL and burn scar status and their relationship with burn-related characteristics, identify differences in HRQoL related to sleep disorders and depression, and finally identify the influencing factors on HRQoL for severe burn patients in South Korea. The mean scores for the HRQoL and total scar status in our study were 2.28 and 34.45 respectively, which are lower than those in recent assessments of Korean burn patients [6,18]. Significant differences in HRQoL and scar status were related to fourth-degree burns, having joint involvement, and emotional distress. There were no differences related to cause of burn, visibility of a scar, and burn range in HRQoL and scar status. This is interesting because generally more severe burns are associated with lower HRQoL and scar status [1,19]. The current study suggests that the burn depth and joint involvement, not burn range and cause, may be the primary factors related to the level of HRQoL and scar status.

Unlike previous research, there was no statistical difference in HRQoL and scar status in patients with a visible scar [1]. This finding may be related to the small sample size of the no visible scar group and the associated inability to detect a difference between the visible scar and no visible scar groups. In addition, data collection was completed before patients were discharged meaning that they had not yet had experience with being in public with a visible scar. Therefore, longitudinal research to examine any changes in HRQoL and psychosocial adaptation after discharge would be beneficial.

In this study, approximately 68% of participants had sleep disturbances, while 57% suffered from depression. Sleep disturbance is one of the common issues for severe burn patients: one previous study reported that one-third of severe burn patients experience sleep issues one year after discharge [20]. The majority of study participants complained of sleep issues at the point of discharge meaning they may have continued issues of posttraumatic stress symptoms. Burn patients experience post-surgical pain, rehabilitation needs, and issues with reintegration to society at discharge, and these problems may cause sleep disturbance and unresolved posttraumatic stress symptoms [7]. In addition, over half of the patients had depression at discharge in this study. This is consistent with previous research in which depression within the first two months after the burn was reported by up to 53% [21] and 50% [18] in a Korean study. Depression is one of the most common psychological problems, and most burn patients experience hopelessness, which may lead to chronic depression [22].

The current study also presented the negative effects of sleep disturbances and depression as psychological issues related to HRQoL. Burn patients with sleep and depression problems reported decreased levels on all nine subdomains of the HRQoL. This finding supports results in previous studies in which HRQoL was significantly lower in those with depressive and posttraumatic stress symptoms [18,23]. Issues such as sleep disturbances and depression may be destructive for the HRQoL of severe burn patients because of the cognitive, psychological, social, and physiological relevance of these. Health care professionals should pay attention to early detection, close monitoring, and intense intervention for sleep disturbances and depression in severe burn patients.

〈Table 4〉 Factors Affecting HRQoL Following Severe Burn Injury (N=145)

Variables	Model 1				Model 2			
	B	SE	β	p	B	SE	β	p
Burn degree (4th)	0.40	.14	.24	<.001	0.15	.08	.09	.063
Burn range (%)	0.01	.00	.21	.011	0.01	.00	.14	<.001
Joint involvement (yes)	0.34	.16	.16	.043	0.14	.09	.07	.149
Scar status					0.01	.00	.15	.012
Sleep disorder					0.18	.08	.14	.033
Depression					0.07	.01	.58	<.001
	R^2= .19, adj R^2=.17, F(p)=10.88 (<.001)				R^2= .75, adj R^2= .74, F(p)= 69.90 (<.001)			

HRQoL=health-related quality of life.

In the prediction of HRQoL by hierarchical regression, burn-specific variables were entered in the first step, and burn degree (4^{th}), burn range (%), and joint involvement were significantly related to HRQoL. Patients with more severe burn degree and range and joint injury reported lower levels of HRQoL than their counterparts. Previous study findings also showed a relationship between burn severity and HRQoL in burn patients [6,8]. Recent studies reported that quality of life after burns is more determined by scar characteristics than burn severity [1,6]. Furthermore, the current study identified the effects of psychological problems on HRQoL, after burn-specific variables are taken into account. Burn degree and range and joint involvement explained about 19% of the variance in HRQoL; the variance explained increased up to 75% as perceived scar status, depression, and sleep problems were added to the model. Among the burn-related and psychological variables, scar status, depression, and sleep problems were identified as the main modifiable factors influencing HRQoL in severe burn patients.

Perceived scar status is an important influencing factor on HRQoL [6], and scar-related symptoms have a direct association with psychological function and HRQoL [5]. A literature review reported that depression and posttraumatic stress symptoms such as sleep disturbances were associated with decreased HRQoL [8]. It may be possible that a depressive mood subsequently results in increases in pain and decreases in physical function. However, because of the cross-sectional nature of the study, cause and effect relationships, such as those between psychological problems and HRQoL, cannot be inferred.

Literature shows that burn patients may experience ongoing psychological problems even after discharge [8]. Psychological issues, such as depression and sleep disorders as identified in this study, should be closely monitored. Health care providers and home care nurses should develop and include psychological intervention as an aftercare program, particularly for those who report depression and sleep problems at discharge.

The current study has a few limitations that should be acknowledged. Study results might not be generally applicable to burn patients in other cultural contexts. The cross-sectional nature of the study might be another limitation, so cautious interpretation of the causality of the antecedents of HRQoL must be taken.

Conclusion

Survivors of severe burn injuries stay in the hospital for a prolonged time, and their suffering from pain, functional limitation, psychological distress such as depression, and sleep problems goes on after discharge. The current study shows that the majority of severe burn patients experience sleep disturbances and depression as psychological issues. Those with severe burn depth and range and joint involvement have a low HRQoL as well as a poor scar status. Home care nurses should consider continuing scar management and psychological intervention focusing on sleep and depression may improve HRQoL of burn patients, especially those with severe burn injuries.

Conflicts of Interest

The authors declared no conflict of interest.

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Purpose: Severe burn injuries require long periods of hospitalization and treatment, which results in various physical and psychological issues. The main purpose of this study was to identify burn characteristics and psychological problems that influence Health Related Quality of Life (HRQoL) after discharge. **Methods:** A cross-sectional descriptive study using mobile/web or paper-based survey methods was conducted from a major burn center. A total of 145 patients completed the scar assessment, quality of life, sleep disorders, and depression scales. **Results:** The overall mean HRQoL and scar status scores were 2.28 out of 5 and 34.45 out of 60 points, respectively. Participants with higher burn degree, joint involvement, and emotional distress reported significantly lower HRQoL and scar status. Participants with depression and sleep problems also had lower HRQoL. Significant predictors of HRQoL included burn range, scar status, depression, and sleep issues. **Conclusion:** The results show that patients with severe burn injury experience high levels of physical and psychological problems. Patients with severe burn injury and psychological problems such as depression and sleep are likely to experience a reduced HRQoL. Psychological management and intervention in home care setting may improve HRQoL of burn patients.

Key words : Burns, Quality of life, Cicatrix, Depression, Sleep

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