Int J Burn Trauma 2020;10(3):81-89
www.IJBT.org /ISSN:2160-2026/IJBT0115555

Original Article

Predictors of generic and burn-specific quality of life among adult burn patients admitted to a Lebanese burn care center: a cross-sectional single-center study

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Received May 4, 2020; Accepted June 11, 2020; Epub June 15, 2020; Published June 30, 2020

Abstract: Burn injuries carry significant implications on short- and long-term quality of health. The present study undertook the first attempt to characterize generic and burn-specific quality of life and their predictors among adult burn patients admitted to a Lebanese burn care center. 130 adult patients admitted to the Lebanese Geitaoui Hospital burn center between 2013 and 2019 willingly answered Arabic versions of RAND's 36-Item Short Form Survey (SF-36), and the Burn-Specific Health Scale-Brief (BSHS-B). Results showed that burn patients continue to exhibit impairments on various generic and burn-specific quality of life subdomains. Education, pain and total body surface area (TBSA) burned were consistently and significantly correlated with both BSHS-B and SF-36 component scores, while inhalation injury exhibited an association with total BSHS-B score. Education and pain emerged as independent predictors of SF-36 components as well as total BSHS-B score. The latter was additionally associated with BMI and burn degree, while TBSA burned negatively correlated with SF-36 physical component scores. Correlates of impaired quality of life among Lebanese adult burn patients should therefore be taken into account and existing burn management practices and rehabilitation programs should be revised accordingly in order to ensure optimal long-term patient outcomes.

Keywords: Burn injuries, quality of life, predictors, outcome

Introduction

While burn still carry significant implications in terms of survival [1], the improvement in burn patient mortality rates have fueled research into the long-term outcomes of burn injuries [2]. Regardless of their severity, burns incur long-term morbidity such as musculoskeletal diseases [3], nervous system diseases [4], and infectious diseases [5], among other conditions. The current understanding and management of burns should thus be shifted in order to account for these injuries as chronic diseases [6].

Even when sustaining minor burns, patients were shown to exhibit decreased functional capacity [7], mental disorders [8, 9], as well as impaired quality of life [10] in response to their injury. Patients most often suffer from deteriorations in body image, work issues, pain and discomfort, persisting years after burn incidents [10, 11]. Health-related quality of life measures generally reflect self-reported perceptions of health condition in its physical, social and mental aspects [12] and have been repeatedly adapted in order to better reflect burn-related impairments in survivor well-being [13].

Considering the variability and gaps in reports of factors influencing quality of life among burn patients [10, 14], establishing the local predictors of both burn-specific and generic quality of life is invaluable for the formulation of targeted burn-patient management and rehabilitation. However, the functional and psychological outcomes of burn injuries remain poorly investigated in Lebanon, both in acute and long-term settings. As such, the present study attempted

to characterize generic and burn-specific quality of life and determine their predictors among adult burn patients admitted to a Lebanese burn care center.

Patients and methods

The present study was a cross sectional investigation of generic and burn-specific quality of life among 350 adult patients admitted to the Lebanese Geitaoui Hospital burn center between 2013 and 2019.

Inclusion criteria

All adult (between 18 and 64 years old) surviving patients that were admitted to the burn center during the study period were contacted by phone. 130 consenting patients were included in the study. Pediatric and elderly patients (younger than 18 years of age, and older than 64 years, respectively) and patients with known major psychiatric disorders were excluded and were not invited to participate.

Ethical considerations

The study protocol was reviewed and granted a written study approval from the Lebanese University's research committee as well as the institutional review board at the Lebanese Geitaoui Hospital. This study was conducted in accordance with the US Code of Federal Regulation 45-CFR-46.107, 21-CFR-56.107, Good Clinical Practice ICH Section 3 and the principles laid down by the 18th World Medical Assembly in Helsinki in 1964 and all applicable amendments. All patients consented to participate in the study.

Variables

Demographic (sex, age, BMI) and burn characteristics (TBSA, burn degree, burn cause, age at burn incident, time since burn incident and inhalation injury occurrence) were collected retrospectively from patients' medical records. Participant data was collected under individual designated codes, thereby ensuring the anonymity of personal and medical data.

Patient-reported generic health status was evaluated through RAND's 36-Item Short Form Survey, while the brief version of the Burn-Specific Health Scale (BSHS-B) [15] reflected burn-specific quality of life. Consenting patients were contacted by phone, through which Arabic versions of the SF-36 and BSHS-B were administered. Patients also provided their educational level and an assessment of pain intensity or frequency on a scale of 0 (no pain) to 100 (worst/highest frequency of pain).

The validated Arabic translation of the BSHS-B was adapted from Abd Latif et al. (2019) [16], while the Arabic version of SF-36 developed and validated by RAND Health Care [17] was used. The SF-36 scores were divided into two components, namely the physical component score, and the mental component score. The physical component score reflected the mean of the physical functioning, role limitations due to physical health, pain, and general health domains, while role limitations due to emotional problems, energy/fatigue, emotional well-being, and social functioning comprised the mental component score.

Statistical analysis

Data analysis was completed using SPSS version 22. Descriptive statistics served for the calculation of the frequency, mean and SD of all study variables. The univariate predictors of generic and burn specific quality of life were determined using ANOVA test, t test, or Pearson correlation test, where applicable. Multiple regression models were then used to reflect the significant independent predictors of total BSHS-B score, as well as SF-36 mental and physical component scores. Two-sided *p*-values were calculated in all tests, with statistical significance set at $P < 0.05$.

Results

130 patients admitted to the Lebanese Geitaoui Hospital burn center from 2013 till 2019 willingly participated in this study. As shown in **Table 1**, mean participant age was 44.6 years, with a slightly lower mean age at burn incident (39.5 years). Patients were predominately male (73.1%) and had secondary or higher education (66.7%). Mean time since burn incident was approximately 3 years, with relatively low levels of pain reported by patients on a VAS scale of 0 to 100. Mean TBSA burned was 24.5% in the patient population, the majority of which suffered from 3rd degree burns (68.5%) caused by

Table 1. Demographic and burn characteristics of adult patients admitted to the Lebanese Geitaoui Hospital burn center from 2013 till 2019

Variable	Burn patients (N = 130)
Demographic characteristics	
Mean age (years ± SD)	44.6 ± 17.2
Mean age at burn incident (years ± SD)	39.5 ± 17.2
Gender (n (%))	
Male	95 (73.1%)
Female	35 (26.9%)
Education (n (%))	
Illiterate	6 (7.1%)
Primary	22 (26.2%)
Secondary	34 (40.5%)
University degree	21 (25.0%)
Graduate and post-graduate degree	1 (1.2%)
Mean BMI (kg/m^2 ± SD)	26.1 ± 4.9
Burn characteristics (n (%))	
Mean time since burn incident (months ± SD)	36.8 ± 16.1
Pain (mean ± SD)	9.6 ± 17.3
Percentage TBSA burned (mean)	24.5%
Burn degree (n (%))	
1^{st}	2 (1.5%)
2^{nd} (superficial)	4 (3.1%)
2^{nd} (deep)	35 (26.9%)
3^{rd}	89 (68.5%)
4^{th}	0 (0.0%)
Burn cause (n (%))	
Electrical	15 (11.5%)
Contact	3 (2.3%)
Flame	90 (69.2%)
Scald	18 (13.8%)
Chemical	4 (3.1%)
Smoke inhalation injury (n (%))	15 (11.5%)

flames (69,2%), while only 11.5% suffered from smoke inhalation injury.

General and burn-specific health status

The general health status of patients was assessed through the SF-36, while the BSHS-B reflected burn-specific quality of life. On average, the highest SF-36 scores were evidenced on the level of pain and both social and physical functioning. Patients reported notable role limitations in regards to physical and emotional issues, in addition to fatigue and reduced emotional well-being and general health (**Table 2**).

As for burn-specific health scores, total BSHS-B score was 126.44 among our patient population. The lowest measures were reported on the level of body image, sexuality, simple abilities, heat sensitivity and work domains, while affect, hand function and treatment regiments had the highest scores (**Table 3**).

Univariate predictors of generic and burn-specific QOL

Univariate predictors of total BSHS-B score as well as the scores of SF-36 mental and physical components were determined, as shown in **Table 4**. Education, pain and percentage TBSA burned exhibited highly significant associations with all three scores. On the other hand, inhalation injury emerged as a significant predictor of total BSHS-B score ($P = 0.043$) but not SF-36 mental or physical component scores ($P > 0.05$). That being said, total BSHS-B score was highly correlated with both the mental ($P < 0.0001$; Pearson correlation = 0.870) and physical ($P < 0.0001$; Pearson correlation = 0.762) component scores of SF-36.

Multivariate predictors of total BSHS-B score

Multivariate analysis revealed that pain was the most significant negative predictor of total BSHS-B score among burn patients ($P < 0.0001$). Higher burn-specific quality of life was positively and independently associated with BMI as well as education ($P = 0.021$ and $P = 0.016$, respectively), while increasing burn degree negatively influenced burn-specific health scores ($P = 0.009$) (**Table 5**).

Multivariate predictors of SF-36 mental and physical component scores

Education and pain were demonstrated as significant independent correlates of both the mental and physical component scores of SF-36 (**Table 6**). Increasing education and lower pain levels predicted better general mental and physical health among patients, while TBSA burned negatively influenced physical, but not mental, well-being ($P = 0.024$).

Table 2. General health status (SF36) of burn patients admitted to the Lebanese Geitaoui Hospital between 2013 and 2019

		Burn patients (N = 130)	
		Mean	SD
Physical component scores	Physical functioning	84.9	23.1
	Role limitations physical	65.4	42.8
	Pain	87.0	21.7
	General Health	69.4	25.3
Mental component scores	Role limitations emotional	65.6	43.9
	Energy/fatigue	65.0	26.0
	Emotional well-being	65.7	25.4
	Social functioning	74.1	28.3

Table 3. Burn specific health scores-brief (BSHS-B) of patients admitted to the Lebanese Geitaoui Hospital between 2013 and 2019

	Burn patients (N = 130)	
	Mean	SD
Heat Sensitivity	12.72	7.37
Affect	22.18	7.35
Hand Function	17.24	5.21
Treatment Regimens	16.93	4.31
Work	11.68	5.77
Sexuality	10.28	2.43
Interpersonal Relationships	14.18	3.42
Simple Abilities	11.28	2.02
Body Image	9.95	5.62
Total BSHS-B score	126.44	30.08

Discussion

To the best of our knowledge, the present study was the first to examine burn-specific and generic quality of life among adult burn patients admitted to a Lebanese burn care center. 3 years after sustaining a burn injury, role limitations, fatigue, as well as impaired emotional and general health remain prevalent. Burn-specific quality of health data revealed that issues with body image, sexuality, work, simple abilities and heat sensitivity continue to afflict burn patients. Education, pain and percentage TBSA burned emerged as univariate correlates of BSHS-B and SF-36 scores in both its mental and physical components, while inhalation injury was significantly associated with BSHS-B score only. Multivariate models showed that education and pain could independently predict SF-36 and total BSHS-B score. BMI and burn degree were also significantly correlated with total BSHS-B score, while TBSA burned negatively influence SF-36 physical component scores.

Results from generic and burn-specific quality of life instruments were highly correlated in this study. SF-36 scores revealed that burn patients continue to suffer from role limitations, fatigue, as well as reduced emotional and general health 3 years after the burn incident. Conversely, researchers have reported that both physical and emotional-related role limitations were lowest in a population of patients admitted to a burn center in Germany [18]. Integrating emotional and social support into post-burn rehabilitation efforts in Lebanon, where emotional and mental health remains underappreciated, is thus critical. This is especially important considering the implication of perceived social support in the promotion of good mental health among burn patients [14, 18, 19]. Stigmatization and invalidation have actually been reported by burn patients to cause suffering, social distancing and by extension, impaired quality of life following burn accident [20]. Strategies to improve burn patient quality of life should also include victims' social environment in the scope of educational approaches in order to alleviate negative burn perceptions and promote social support.

Through the BSHS-B, it was evident that body image and sexuality issues predominate 3 years after suffering burns in our patient population, in addition to trouble with work, simple abilities and heat sensitivity. While evidence supports an improvement over time in some burn-related psychological and physical issues, problems with heat sensitivity, work and body image seem to persist even 7 years after injury [21] and seem to be consistently prevalent in extant literature [10, 21, 22].

Our findings demonstrated the insignificance of demographic variables, with the exception of education, as univariate predictors of burn

Table 4. Univariate predictors of total BSHS-B, SF-36 mental component and physical component scores of patients admitted to the Lebanese Geitaoui Hospital between 2013 and 2019

	Total BSHS-B score	SF-36 mental component score	SF-36 physical component score
Demographic characteristics			
Mean age (years ± SD)	0.251‡	0.562‡	0.981‡
Mean age at burn incident (years ± SD)	0.257‡	0.569‡	0.943‡
Gender (n (%))	0.114ϕ	0.067ϕ	0.195ϕ
Education (n (%))	0.002†	0.002†	0.004†
BMI (kg/m^2 ± SD)	0.185‡	0.074‡	0.253‡
Burn characteristics			
Mean time since burn incident (months ± SD)	0.928‡	0.938‡	0.733‡
Pain (mean ± SD)	< 0.0001‡	< 0.0001‡	< 0.0001‡
Percentage TBSA burned (mean)	0.01‡	0.029‡	0.001‡
Burn degree (n (%))	0.062†	0.318†	0.597†
Burn cause (n (%))	0.618†	0.828†	0.915†
Smoke inhalation injury (n (%))	0.043ϕ	0.102ϕ	0.742ϕ

†*p* values calculated via ANOVA test, ϕt test, or ‡Pearson correlation test, as applicable. Significance was set at *p* value < 0.05. SD: Standard Deviation; TBSA: Total Body Surface Area.

Table 5. Multivariate predictors of total BSHS-B score of patients admitted to the Lebanese Geitaoui Hospital between 2013 and 2019

	Total BSHS-B score	
	Beta (CI 95%)	*p*-value
BMI	1.45 (-0.11; 2.81)	0.021
Education	8.18 (0.88; 14.64)	0.016
Burn degree	-11.38 (-19.12; -4.30)	0.009
Pain	-0.85 (-1.63; -0.308)	< 0.0001

patient generic or burn-specific quality of life. Previous studies in burn populations have similarly reported that age and gender were not significantly associated with overall BSHS-B scores [22, 23], or the physical and mental components of SF-36 [18]. However, significant correlations could be demonstrated when examining these variables in relation to BSHS-B [14, 22, 24] and SF-36 sub-domains [14, 24]. The implication of patient age in the physical and psychological sequelae of burn incidents remains ambiguous, with some studies supporting its protective role [25] and others demonstrating its prediction of poorer quality of life [18]. When noted, the role of gender in the modulation of the impact of burn injuries on physical and social functioning is similarly difficult to explain [24]. Further investigation is therefore necessary in order to determine whether age and gender predispose towards improved recovery or greater susceptibility to physical and psychological disorders.

Educational level was not frequently examined in burn cohorts in relation to their quality of life, and was often insignificant in this regard [14, 26]. Regardless, education was established as an independent predictor of better generic quality of life in both its physical and mental components in our study, with bivariate correlation with BSHS-B score noted in others [27]. Similarly, illiteracy was previously associated with the lowest overall burn-specific quality of life, while holding a university degree seemed to ensure the highest quality of life [22]. Access to self-care training material carries a significant positive impact on the quality of life of burn patients in its physical, psychological and social aspects [28]. Education could therefore afford burn victims with a more comprehensive understanding of and better access to effective burn wound management, which could reflect positively on coping, recovery and quality of life. Patients actually seem to exhibit better professional recovery after burn incidents should they have a higher educational level [29]. That being said, further investigation remains necessary in order to elucidate the exact mechanism through which educational attainment confers patients with improved physical and emotional rehabilitation.

Table 6. Multivariate predictors of mental and physical component scores of SF-36 of patients admitted to the Lebanese Geitaoui Hospital between 2013 and 2019

Variable	SF-36 Mental component score		SF-36 physical component score	
	Beta (CI 95%)	*p*-value	Beta (CI 95%)	*p*-value
Education	8.10 (1.44; 13.86)	0.012	5.16 (0.31; 9.61)	0.036
Pain	-0.461 (-1.05; 0.03)	0.023	-0.38 (-1.12; 0.02)	0.025
TBSA	-	-	-37.44 (-76.34; -0.52)	0.024

The association between BMI and health-related quality of life in non-burn populations seems to be U-shaped and dependent on multiple factors such as age, ethnicity and physical activity [30, 31]. Obesity carries significant implications in terms of morbidity and mortality in burn patients, along with potential wound healing complications [32]. However, the correlation between weight and quality of life of burn survivors remains poorly understood. Evidence suggests that adolescent burn victims exhibit better coping and quality of life than their peers, in addition to higher satisfaction with their weight [33]. More importantly, functional outcomes in patients sustaining burn injuries differed significantly in relation with their BMI, albeit at variable cutoff values when considering individua functional domains [34]. In the present study, an improvement in burn-specific quality of life could be detected concomitantly with an increase in BMI. It is therefore noteworthy to considering optimizing existing rehabilitation programs according to BMI in an effort to improve patient outcomes.

Burn patients' quality of life remains dependent on TBSA of burn injury, which was supported as a univariate predictor of both generic and burn-specific quality of life in our findings. Studies have reported its significant association with generic quality of life [24] and both overall BSHS-B scores [22, 24], as well as the majority of its subdomains [22]. Nonetheless, the role of this variable wanes in our multivariate models, consistently with other studies employing either components of SF-36 [18, 19] or BSHS domains [35]. It thus seems that the predictive power of TBSA could be lost once subjective patient measures were accounted for [36]. Regardless, the influence of TBSA cannot be completely ignored, as it persisted as a negative correlate of the physical component score of SF-36 in our study. Patients with extensive burns wounds tended to have lower functional performance [29] and worse perceptions of burn scar condition [36], body image, as well as social, emotional, and work function [37]. Considering the negative reflection of increased TBSA burned on burn-specific quality of life [36, 37], special care should be exercised in the physical and emotional rehabilitation of patients suffering from high range burn wounds.

In a similar vein, burn degree remains a notable factor affecting burn-specific quality of life in burn patients, as revealed by multivariate analysis in our study. Similar observations have been previously reported when investigating the relationship between full thickness burns and total BSHS-B score [36], as well as the scores of the mental and physical components of SF-36 [19, 24]. Hypertrophic scarring is a common sequelae of full or high thickness burns [38] and could affect patient quality of life. Poor subjective scar assessment has actually been shown to mediate the implication of burn degree in impaired burn patient quality of life [36]. Specifically targeting patients with severe burns in an effort to curb the critical and persistent influence of body image and scarring on quality of life could be a noteworthy consideration in burn management practices.

Total BSHS-B score was also associated with the presence of an inhalation injury among adult burn patients participating in our study. However, similar associations were not previously demonstrated when examining the correlates of the mental and physical components of the SF-36 [18]. Moreover, pediatric burn patients with or without inhalation injury exhibited comparable long-term burn-specific quality of life [39]. That being said, inhalation injury carries notable long-term implications in terms of morbidity and mortality [40, 41] and further studies are needed to probe the possible implication of inhalation injuries in patient quality of life.

Evidence from non-burn populations supports significant impairments of both physical and mental quality of life in individuals suffering

from chronic pain [42, 43]. Moderate or severe pain is a common persistent sequelae to burn injuries, with significant implications on burn patient daily function [44, 45]. It therefore stands to reasons that pain has been previously correlated with impaired burn-specific [27] as well as generic quality of life [18, 44]. Our findings supported these associations, reflecting lower burn-specific and generic quality of life in both its components among burn patients along with increasing levels of burn-related pain. However, pain management poses a persistent challenge facing clinicians caring for burn patients [46]. This emphasizes the need for serious efforts and interventions to improve burn patients' quality of life, especially considering the latter's prediction of chronic burn-related pain when impaired.

Conclusion

The present study provided valuable insights into the predictors of Lebanese adult patients' quality of life. Our findings revealed the role of various demographic and burn-related variables (e.g. BMI, education, pain, TBSA burned and burn degree) in predicting generic and burn-specific quality of life. While further investigation is required, our results reflect high-risk patient profiles and could thereby guide efforts to improve existing burn management practices and future targeted rehabilitation programs.

Acknowledgements

The authors would like to thank Nancy Al Akkary (MSc.) and Bachir Atallah (MCh.) for writing and editorial assistance.

Disclosure of conflict of interest

None.

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