

Health-related Quality of Life Two Years After Injury Due to Terrorism

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ABSTRACT

Background: During the past few decades, terrorist acts have been an unfortunate reality worldwide. There is a striking paucity of research investigating the multitude of long-term outcomes after severe physical injury due to terrorist attacks, a unique subgroup of trauma patients. The purpose of this study was to provide a profile of the long-term health-related quality of life (HR-QOL) after injury due to terrorist attacks and to explore the relationships between Post Traumatic Stress Disorder (PTSD), occupational status and injury severity with HR-QOL

Methods: We included 35 survivors of terrorist attacks living in the community, two years on average after the injury, mean age at follow-up = 32.1 (\pm 13.8), mean Injury Severity Score (ISS) = 27 (\pm 14.2). The subjects were recruited from consecutive admissions to a rehabilitation department in a tertiary care center between September 2000 - June 2004. Most of the subjects suffered multiple trauma. The main outcome measures were the Short-Form Health Survey (SF-36), Post Traumatic Diagnostic Scale and return to work rates.

Results: The mean scores on 6/8 of the SF-36 subscales were significantly lower among the survivors compared to normative population norms. Post Traumatic Stress Disorder (PTSD) was found in 39% of the sample and 43% did not resume their main occupation two years after the injury. Multivariate analysis of variance of PTSD and occupational status (returned vs. did not return to work) on quality of life scores revealed significant main effects for both PTSD ($p = .000$) and occupational status ($p = .005$) with no interaction

effect ($p = .476$). No significant correlations were found between injury severity and the SF-36 scores.

Conclusions: This study demonstrated the long-term impact of injury due to terrorism. Results showed independent effects of PTSD and occupational status on health related quality of life, two years after injury. These findings suggest that this group may benefit from intervention focusing on their emotional and occupational status in order to improve their quality of life.

INTRODUCTION

During the past few decades, terrorist acts have been an unfortunate reality worldwide. From September 2000 to January 2006, 7,633 individuals have been injured in terrorist attacks in Israel (1) and unfortunately many more worldwide, posing a serious challenge for acute care and rehabilitation services. Definitions of terrorism are usually complex and controversial. However, in order to promote international consensus concerning these atrocities the United Nations (UN) proposed using the definition of the League of Nations Convention from 1937: "All criminal acts directed against a State and intended or calculated to create a state of terror in the minds of particular persons or a group of persons or the general public" (2). Terrorist activities are characterized as the use of increasingly dramatic, violent, and high-profile attacks in furtherance of political/social objectives, such as hijackings, hostage takings, kidnappings, car bombings, and, frequently, suicide bombings. The victims and locations of terrorist attacks often are carefully selected for their shock value, such as shopping centers, bus and train stations, and restaurants and nightclubs (3).

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Current research on the health related issues of this population has focused on the unique characteristics of the victims of terrorist attacks mainly during the acute stage after injury. It has been shown that terrorist attacks worldwide (4) and especially in Israel (5-9), Spain (10, 11) and Australia (12), most of them bombings, inflicted injury of a distinctly different pattern than other causes of trauma. Patients hospitalized after bombing incidents were typically younger, suffered from increased injury severity with more body regions involved compared to non-terror-related trauma patients. Furthermore, enhanced use of intensive care, prolonged hospital stay, more surgical interventions and increased hospital mortality were also characteristics of these patients (5-9). The remainder of the studies conducted on the effects of injury due to terrorism has focused on the emotional consequences, especially Post Traumatic Stress Disorder (PTSD) (13-15). Studies found that in direct survivors, the frequency of PTSD that was found in the aftermath of the attacks was 39% (13, 14) and 25% to 31% 2.6 years on average after the attack (14, 15). In sum, the outcome literature on trauma due to terrorism is limited primarily to the injury pattern in the acute phase and to the emotional consequences of the trauma. However, several follow-up outcome studies have been performed among broadly defined injury-related trauma populations, mainly caused by motor vehicle accidents, work injuries and crime assault, on levels of functioning, disability and quality of life (16-21). Taken together, the results of these studies point to a complex pattern of injury among survivors, involving physical (e.g., chronic pain), emotional (e.g., PTSD) and functional disabilities (e.g., employment and instrumental activities of daily living), and decreased quality of life in the long term after the trauma. There is a lack of studies relating to broader outcomes of return to work and Health-Related Quality of Life (HR-QOL) in survivors of injury due to terrorist attacks, which have been proposed as important outcome measures in trauma victims (17). HR-QOL represents a subjective person-centered measure of well-being in relation to multiple domains that are affected by health status (such as physical and emotional status) (22). Thus, the aim of this study was to provide a profile of the long-term health-related outcomes of injury due to terrorist attacks. Specifically the objectives were to describe the domains of HR-QOL, the presence of PTSD and occupational status of survivors of terrorist attacks residing

in the community two years on average after the injury. A secondary objective was to explore the relationships between PTSD, occupational status and injury severity with HR-QOL. Given the recent rise in terror attacks worldwide, such research may be helpful in meeting the long-term health-related needs of these individuals.

METHODS

PARTICIPANTS

The 35 subjects of this study were recruited from consecutive admissions to the rehabilitation department of Hadassah Hospital, Mount Scopus, Jerusalem, between September 2000 and June 2004. The study was approved by the Helsinki Committee of the hospital. The study inclusion criteria were: subjects suffering injuries due to terrorist attacks, were civilians at the time of the injury, were at least one year post injury, were currently residing in Jerusalem, and were at least 17 years old at follow-up. Seventy-four subjects met the above inclusion criteria, of these, one died, three foreign workers returned to their countries, four could not be located, 16 were living outside Jerusalem, two were living abroad and two were immigrants who did not have sufficient knowledge of Hebrew to be interviewed. Explanatory letters with informed consent (specifying that data collection would include gathering information from the hospital medical records and home interview) were sent to the 46 individuals who were eligible for follow-up. Thirty-five subjects (76% of those eligible) gave their informed consent to participate in the study. The follow-up questionnaires were collected through interviews conducted by an experienced occupational therapist in the subjects' homes.

Demographic and injury variables of the sample are presented in Table 1. The majority of the subjects were young (mean age at follow up was $32.1y \pm 13.8$) and had completed high school education. Most of the subjects suffered Multiple-Trauma (MT) and the average ISS at the time of injury was 27, indicating an overall high severity of injury in this sample. Concerning the mechanism of injury, all the subjects were injured as a result of a suicide bombing. The settings of the attacks were buses (10), restaurants and indoor cafes (11), semi-confined spaces (3) and open spaces such as bus stops and shopping centers (11). The mean time since injury was two (SD=1.1) years, and the mean time since discharge from rehabilitation (inpatient or outpatient) was 20 months (SD= 10.31, range 5 to 39).

Table 1. Demographics and Injury Variables

Variable		Mean (SD)	Range
Age at follow-up		32.15 (13.8)	14-74
Time since injury (years)		2 (1.1)	1-3.5
Years of education		13.2 (3.4)	0-20
		N	%
Gender	Men	17	48.6%
	Women	18	51.4%
Family status	Single	21	60%
	Married	12	34%
	Divorced	1	3%
	Widow	1	3%
Type of injury	Multiple Trauma (MT)	25	71.4%
	Traumatic Brain Injury (TBI)	6	17.1%
	Spinal Cord Injury (SCI)	4	11.4%
ISS score	1-8 (Mild injury)	2	6.8%
	9-15 (Moderate injury)	5	17.2%
	16-24 (Severe injury)	5	17.2%
	>25 (Very severe injury)	17	58.6%

Abbreviations. ISS: Injury Severity Score; SD: Standard Deviation

MEASURES

Medical Outcome Study 36-Item Short-Form Health Survey. The Medical Outcome Study 36-Item Short-Form Health Survey (SF-36) (23-25) is a generic measure of HR-QOL that has been extensively validated and used by researchers to study a variety of disease states. This measure consists of 36 items that encompass eight areas of health: physical functioning, role limitations due to physical health problems, bodily pain, general health, vitality, social functioning, role limitations due to emotional problems and mental health. Results are presented on a scale of 0 to 100; higher scores reflect better health status. A total score and two aggregate scores are calculated from the measure: the physical component summary score (PCS) (which is the mean score of four scales: physical functioning, role physical, bodily pain, general health) and the mental component summary score (MCS) (which is the mean score of four scales: vitality, social functioning, role emotional and mental health.). The SF-36 Hebrew version was used in the current study. The psychometric properties of this version were evaluated based on a sample of the adult population of Israel (26). Reliability scores (Cronbach's

alpha) ranged from 0.76 to 0.93. The analysis also showed that the SF-36 scales are able to discriminate among population groups known to have different levels of health and thus can serve as valid indicators of health status in Israel.

Post Traumatic Diagnostic Scale. The PDS (27) is a widely used, psychometrically reliable and valid self-report measure of PTSD. The PDS yields a diagnosis according to DSM-IV criteria. It probes the 17 symptoms of PTSD (5 reexperiencing, 7 avoidance and 5 hyperarousal) from the DSM-IV. For each item participants rate, on a 4-point scale, the degree to which each symptom has bothered them in the past month (0 = not at all; 3 = five or more times a week/ almost always). To obtain a PTSD diagnosis from the PDS, the DSM-IV diagnostic procedure for PTSD is followed: at least 1 reexperiencing symptom, at least 3 avoidance symptoms and at least 2 arousal symptoms must be endorsed with a score of 1 or above. The PDS has been shown to have high internal consistency ($\alpha = .92$) and good test-retest reliability ($r = .74$). Agreement between PTSD diagnosis obtained from the PDS and structured clinical interview for PTSD was 82%, sensitivity of the PDS was .89 and its specificity was .75 (27, 28).

Injury Severity Score. The injury severity score (ISS) (29) is used to quantify the severity of injury and allows comparison of severity among dissimilar types of injury and therefore was chosen to quantify the diverse effects of injury due to terrorism. The injury severity score is calculated by using the sum of squares of the injury severity, as measured by the Abbreviated Injury Scale (AIS) (30), of the three most severely injured body regions. The ISS ranges from 0 to 75 and can be categorized into four levels of injury severity: 1 to 8 – mild, 9 to 15 – moderate, 16 to 24 – severe and above 24 very severe. Numerous studies have used the ISS to measure injury severity among different types of injury confirming the validity of this measure and extending its potential usefulness (6, 7, 16-18, 21, 31-34). In the current sample the ISS was rated at the time of injury by trauma physicians in the emergency room and for the purpose of this study was obtained retroactively from the medical charts.

Return to work. Information regarding this variable was obtained through a question about whether the subjects returned to their major occupation (i.e., work, study), changed their main occupation as a consequence of the injury or did not resume any main occupation.

All the questionnaires were administered in Hebrew.

DATA ANALYSIS

Statistical analyses were performed using SPSS version 12.0 software. The data were normally distributed on all the outcome variables (Kolmogorov-Smirnov $p > .05$). Hence all the variables were analyzed with parametric statistics. One sample t-test was conducted to compare SF-36 scores of the current sample with Israeli norms. Multiple analysis of variance (MANOVA) was performed in order to examine the effects of PTSD, occupational status, and initial ISS with SF-36 summary scores (MCS, PCS and Total).

RESULTS

According to the PDS, 39% of the survivors were diagnosed as having PTSD.

Regarding return to work, 43% of the sample did not resume their major occupation. Of the survivors who resumed their productivity role (57%), 17% changed their occupation after their injury in line with normal developments (e.g., from student to worker, from soldier to student); and only one participant changed her occupation due to her injury (to a less demanding position). It is worth noting that no significant relationship was found between PTSD and occupational status (Chi-square = 0.008, $p = .930$).

HEALTH-RELATED QOL

The results of the summary scores of the SF-36 revealed that the mean total score was 59.6 (SD=15.5), the mean PCS was 58.9 (SD=16.5) and the mean MCS was 58.1 (SD=17.9). The results of the SF-36 subscales were compared with published norms for the general Israeli population (N = 2,030) (26) and are presented in Table 2. The survivors obtained lower than normative scores on all SF-36 subscales, with the largest notable difference on "bodily pain" and "role emotional" scales. The differences between the groups were statistically significant on all scales except for "role physical" and "general health" scales.

RELATIONSHIPS WITH HEALTH-RELATED QOL

The correlations between the ISS and the SF-36 summary scores were found to be low and non-significant ($r = .269$ with the PCS; $r = .189$ with the MCS; and $.327$ with the total SF-36 score; all not statistically significant). However, moderate signifi-

Table 2. SF-36 Scale Scores: Comparisons Between Survivors and Normative Population in Israel

SF-36 subscales	Survivors (N=35) Mean (SD)	Normative population in Israel (N=2,030) Mean (SD)	T	P
Physical Functioning	66.9 (25.7)	77.3 (26.6)	-2.3	.03
Role Physical	64.3 (41.9)	71.3 (40.8)	-.94	.35
Bodily Pain	55.8 (28.5)	71.6 (29.8)	-3.1	.00
General Health	58.5 (17.9)	62.9 (23.8)	-1.4	.17
Vitality	49.2 (20.1)	56.9 (22.8)	-2.1	.03
Social Functioning	71.2 (29.3)	81.8 (26.8)	-2.1	.04
Role Emotional	52.5 (52.7)	81.1 (35.7)	-3.1	.00
Mental Health	59.3 (15.3)	67.1 (21.7)	-2.2	.03

*The published norms (26) include only the scale scores of the SF-36 therefore no comparison was possible with the summary scores

cant correlations were found between the severity of PTSD symptoms with the SF-36 total score ($r = -.555$; $p < .000$) and the MCS ($r = -.636$; $p = .000$); whereas the correlation with the PCS was lower and non-significant ($r = -.295$). The effect of PTSD diagnoses (with/without PTSD) and occupational status (resumed/did not resume major occupation) on HR-QOL was examined with MANOVA on the SF-36 summary scores (see Table 3). The analysis revealed overall significant main effects on the SF-36 summary scores for both PTSD (Wilks' Lambda $F_{(31,1)} = 8.65$, $p = .000$) and occupational status (Wilks' Lambda $F_{(31,1)} = 5.29$, $p = .005$) with no interaction effect of PTSD * occupational status (Wilks' lambda $F_{(31,1)} = .856$, $p = .476$). Examination of the effects of these variables on the individual summary scores of the SF-36 showed that the subjects without

Table 3. Descriptives and Multiple Analysis of Variance of PTSD and Occupational Status on SF-36 Summary Scores

	Without PTSD (n=20) ^a Mean (SD)	With PTSD (n=13) ^a Mean (SD)	F (p) ^b	Returned to occupation (n=20) Mean (SD)	Did not return (n=15) Mean (SD)	F (p) ^b
PCS	62.4 (15.3)	53.5 (17.5)	1.8 (.19)	59.8 (17.8)	57.5 (14.8)	.07 (.78)
MCS	66.3 (11.7)	45.6 (16.9)	26.3 (.00)	64.1 (15.4)	49 (16.1)	14.8 (.00)
Total	65.8 (11.9)	50.46 (15.7)	10.8 (.00)	63.5 (15.9)	54.1 (12.9)	4.2 (.04)

Abbreviations. PCS: Physical Component Summary Score; MCS: Mental Component Summary Score

^a2 participants did not complete the PDS questionnaire

^bMultivariate analyses results for PTSD (Wilks' Lambda $F_{(31,1)} = 8.65$, $p = .000$) and for occupational status (Wilks' Lambda $F_{(31,1)} = 5.29$, $p = .005$).

PTSD achieved significantly higher mean scores on the MCS and the SF-36 total score than those with PTSD. In addition, the subjects who returned to their main occupation achieved significantly higher mean scores on the MCS than those who did not. Regarding demographics and HR-QOL, the correlation between age and the SF-36 total score was low and non significant ($r = .056$), and there were no significant differences between men and women on these scores ($p > .10$).

The mean scores of the interaction demonstrated the lowest SF-36 scores for the group with PTSD, those who did not resume their major occupation and the highest scores for the group without PTSD, those who resumed their occupation (Table 4).

Table 4. SF-36 Means of the Interaction Between PTSD and Occupational Status

PTSD Diagnosis ^a	Occupational Status ^b	n (%)	SF-36 PCS Mean (SD)
-	+	12 (36%)	64.58 (15.94)
-	-	8 (24%)	59.25 (14.65)
+	+	8 (24%)	52.57 (19.29)
+	-	5 (15%)	54.8 (16.46)
			SF-36 MCS Mean (SD)
-	+	12 (36%)	71 (12.31)
-	-	8 (24%)	59.37 (6.75)
+	+	8 (24%)	53.87 (14.44)
+	-	5 (15%)	32.4 (11.8)
			SF-36 Total score Mean (SD)
-	+	12 (36%)	71 (12.31)
-	-	8 (24%)	59.37 (6.75)
+	+	8 (24%)	53.87 (14.4)
+	-	5 (15%)	32.4 (11.8)

Abbreviations. PCS: Physical Component Summary Score; MCS: Mental Component Summary Score

^a PTSD + : diagnoses of PTSD; PTSD- : no diagnosis of PTSD

^b Occupational status + : resumed major occupation; Occupational status- : did not resume major occupation

DISCUSSION

The results of the study demonstrated the long-term impact of injury due to terrorism. Despite the fact that all subjects were at least one year post injury and several months after discharge from rehabilitation, a considerable number of survivors were living in the community with emotional and occupational consequences of their injury that were found to have a detrimental effect on their current quality of life.

The impact of the injury due to terrorist attacks was clearly demonstrated by significantly lower SF-36 scores

of the survivors compared with those of the normative population. The largest differences between the groups were found on the “bodily pain” and “emotional status” scales of the SF-36, which may shed light on two major HR-QOL issues concerning this population: chronic pain and emotional status. Similarly, the mean scores of the two final components (mental and physical health) of the SF-36 were almost identical, indicating the involvement of both physical and mental health in the quality of life of this group of survivors, on average two years after their injury. To our knowledge, there are no other studies of HR-QOL in direct survivors of terrorist attacks who were physically injured, yet a comparison is warranted with the population suffering multiple trauma due to causes other than terrorist attacks. Several studies on survivors of multiple trauma conducted at a similar time post onset also demonstrated the significant reduction in HR-QOL (as measured by the SF-36) in relation to the normative population in both physical and mental health components (17, 32, 35, 36). A comparison of the SF-36 scores of this sample with those presented by Michaels et al. (19) which investigated HR-QOL in 126 subjects one year after multiple trauma, revealed that the current sample of survivors of terrorist attacks obtained lower scores in “bodily pain,” “role emotional,” and “mental health” scales. The comparison between groups affected by different causes of trauma needs to be further examined, although it may point to possible unique consequences of injury due to terrorist attacks as opposed to other types of traumatic injuries.

The results of the current study contribute to the growing body of research pertaining to PTSD among survivors of terrorist attacks revealing a considerable prevalence and chronicity of emotional sequelae of terrorist attacks (13-15). The diagnosis of PTSD in these studies was determined by the DSM criteria; however the studies differ in their use of clinical interview or self-report questionnaires. Verger et al. (15) studied 196 survivors of the 1995-1996 bombings in France and found PTSD in 31% of the sample, 2.6 years on average after the terrorist attack. Jehel et al. (14) found PTSD in 39% of their sample, comprising 32 victims of a bomb attack in a Paris subway, six months after the attack; however, a small decrease was found in the frequency of PTSD (25%), 32 months after the attack. The frequency of PTSD that was found in the current study (39%) was identical to that found by Shalev and Freedman (13) in a different sample of 39 survivors of terrorist

attacks (also in Jerusalem), at an earlier time point (four months post trauma). One could hypothesize that the similar percentages of PTSD that were found in both studies, despite the fact that they were not conducted at the same time point after the attack, may be due to the different measures of PTSD and hence a reduction in frequency over time was not found. An alternative explanation may lie in the sample characteristics, as the current sample was selected from survivors who suffered severe physical injuries that required physical rehabilitation, whereas the other Israeli sample was not. The incidence of PTSD in survivors with physical injuries has been shown to be higher than in survivors of the same trauma without physical injuries (37), and may explain the high frequency of PTSD at this time point. The implications of the presence of PTSD on the daily life of survivors were shown by the significant main effect that was found for PTSD on the SF-36. This finding is in line with previous studies, which documented the relationship of PTSD with decreased quality of life as measured by the SF-36 in trauma survivors (38-41).

Although the sample consisted of young people, previously employed or in a student role, only 57% of the sample resumed their major occupation. These findings are within the wide range (53-90%) of return-to-work rates after major trauma that were reported in the literature (16, 20-22, 32, 34, 42). The significantly lower SF-36 scores found in our study, of subjects who did not return to their major occupation compared to those who did, are in line with the results of Nandi et al. (43). They investigated the long-term consequences of the September 11 attacks in the United States and found that persons unemployed in the aftermath of a disaster may be at risk for poor mental health in the long-term. It is important to note that both PTSD and occupational status had independent main effects on HR-QOL. A substantial percentage of the survivors were dealing with PTSD, loss of occupational role, or both. The Table of Interactions (Table 4) demonstrated the cumulative effect of these important outcomes, showing, as expected, that individuals with PTSD who did not return to their major occupation had the lowest QOL scores.

Regarding injury severity, the mean ISS of the survivors of trauma due to terrorism at the time of the injury was very high, yet did not significantly effect long-term HR-QOL in this group. This result could be explained by the time interval between ISS and the outcomes measured in this study, and is in line with several other

studies involving survivors of multiple trauma injury that did not find a significant relationship between initial injury severity and long-term outcomes (32, 33, 44, 45). However, a number of studies did show a positive significant relationship between these variables (16-18, 20, 21, 34). This issue requires further investigation in studies of trauma survivors, in order to understand the relationship between initial injury severity and long-term outcomes.

This study is unique in both the population studied and the scope of outcomes examined, therefore promoting an understanding of the long-term HR-QOL of trauma due to terrorism.

This study has several limitations: the small sample size and the fact that the sample was recruited from one rehabilitation center in Jerusalem may limit the generalization of the findings. In addition, despite the comparison to previous outcome studies on multiple trauma, the absence of a comparison group in this study (suffering multiple trauma not due to terrorism, e.g., due to road accidents) may limit the ability to reach conclusions regarding the unique characteristics of trauma due to terrorism as opposed to other types of trauma.

CONCLUSIONS

The study demonstrated the negative impact of injury due to terrorist attacks on long-term health related quality of life (HR-QOL). The results of the MANOVA analysis suggest that interventions to address PTSD and occupational status in survivors of terrorism should be further studied with respect to their impact on long-term HR-QOL. Because terrorism is a worldwide problem, further studies representing other regions and including comparison groups are recommended in order to fully understand the health related implications of injuries due to terrorism attacks.

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