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Evaluation of the effects of disabilities due to traffic accidents on the quality of life using SF-36 health survey

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Objective: The purpose of this study was to investigate the impact of disabilities caused by traffic accidents on quality of life using the SF-36 health survey.

Methods: The study group included 168 patients (30 females and 138 males) injured in traffic accidents referred to the Department of Forensic Medicine to obtain health reports indicating their degree of disability. One hundred twenty-two cases comprised the control group. The degree of disability for the injured body parts was determined based on the related section of the Disability Regulation for patients regarded as recovered based on examination and consultation. Quality of life was calculated using the SF-36 survey. Patients were additionally evaluated using the physical and mental component summary (PCS/MCS) scores.

Results: A statistically significant difference was observed between the groups in terms of the injured body parts. The femur, tibia and/or fibula, vertebrae, radius and/or ulna and the humerus were the most frequently fractured bones. The degree of disability in the patient group was 19.22±17.73. Together with the scores of the eight subscales of SF-36, the PCS and MCS score in the patient group were significantly lower when compared to the control group ($p<0.05$).

Conclusion: An update is required in the Disability Regulation, including the addition of items on deterioration in the quality of life and pain, and the use of the SF-36 scale may be beneficial in this regard.

Key words: Disability ratio; quality of life; SF-36; traffic accident.

According to the General Directorate of Security Affairs, Head of Traffic Services, approximately three hundred thousand traffic accidents were recorded in Turkey during 2009, resulting in 4,300 deaths and 200,000 injuries.[1] Disabilities due to injuries in traffic accidents cause medical, social and economic problems and impose a considerable effect on the quality of life. In addition to health, a number of factors, such as economic status, relations with family and friends, job opportunities, educational opportunities and environmental factors are important in determining the level of quality of life.[2-14]

Quality of life is a multidimensional concept which describes a satisfactory, balanced and healthy life in terms of biopsychosocial and socioeconomic aspects. Various descriptions have been suggested to be related to this subject, such as a 'minimal gap between expecta-

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tions and achievements of the patient' and an 'expression of satisfaction of an individual from life and general status or individual well-being'.[10,15-18] Accordingly, the World Health Organization (WHO) described quality of life as the "perception of an individual of his/her own status in life in terms of cultural aspects and standards of judgment in their own environment and in terms of their own objectives, expectations, standards and interests".[12]

Scales such as the Short Form 36 (SF-36), Nottingham Health Profile (NHP) and the World Health Organization Quality of Life Survey (WHO-QOL) have been developed to evaluate the quality of life. The most frequently used scale is the SF-36.[15-23]

In Turkey, disabled individuals injured in traffic accidents are referred by insurance companies to the health committees of university or Ministry of Health affiliated hospitals and to Department of Forensic Medicine to obtain a report indicating the degree of disability. These organizations utilize the regulation related to the Measurement and Classification of Disabilities and Health Committee Reports Issued for Disabled Individuals.[24]

The purpose of this study was to investigate the impact of disabilities due to traffic accidents on the quality of life using the SF-36 health scale.

Materials and methods

Patients injured in traffic accidents and referred to the Department of Forensic Medicine at Faculty of Medicine, Mersin University to obtain health reports indicating their degree of disability between 2009 and 2010 were included in this study.

Data on accident and injury mechanisms were gathered from patients' medical records. Following the initial evaluation, consultations from the related departments were requested. The degree of disability was determined based on the related section of the Disability Regulation and health reports were prepared for patients regarded as recovered based on examination and consultation findings.[24]

A control group was comprised of cases regarded as having 'no disabilities' (disability ratio 0). Cases regarded as 'disabled' were included in the patient group. Both groups were evaluated in terms of gender, accident description, injured body parts and fractures and the patient group was also evaluated for the degree of disability.

The SF-36 was developed by Ware and Sherbourne in 1992.[21] A Turkish translation and validity and reliability studies were carried out by Koçyiğit et al. in 1999.[20] The scale is composed of 36 questions in 8 subscales; physical functioning (PF), physical role disability (PRD), pain (P), general health (GH), social functioning (SF), emotional role disability (ERD), mental health (MH) and vitality (V). These subscales evaluate the associated quality of life within a range of 0-100 points with 0 point indicating poor and 100 points good health status.[15,20-22,24]

In order to evaluate the quality of life in the patient and control groups, the physical and mental component summary (PCS/MCS) scores were also calculated.[15,20-22,24]

Data were evaluated using SPSS for Windows v11.0 (SPSS Inc., Chicago, IL, USA) program. Results were given as mean±SD and as a percentage (%). Scores of SF-36 subscales did not correlate with normal range; therefore, the Mann-Whitney U test was used in the comparison of two groups, and the non-parametric Kruskal-Wallis test in the comparison of three or more groups. Age and disability points did not correlate with normal range; hence, the non-parametric Spearman correlation was used. A p value of <0.05 was regarded as statistically significant.

Informed written consent to participate in the study was obtained from the participants. The study was approved by the Ethics Committee of the Mersin University Hospital, Turkey.

Results

There was a total of 168 cases in the patient group (30 females [17.9%] and 138 males [82.1%]). The control group comprised a total of 122 cases (45 females [36.9%] and 77 males [63.1%]). There was a statistically significant difference between the patient and the control groups in terms of gender distribution ($p=0.0001$). Age ranges were similar between the groups.

Accident types were determined according to the position of the injured individual; in-vehicle, out-of-vehicle, motorcycle or bicycle accidents. The number of injured cases was not sufficient for comparison and was not included in the analysis. No statistically significant difference in accident distribution was found between the groups ($p>0.05$). A statistically significant difference was observed between the groups in terms of the injured body parts ($p=0.003$); the most frequently seen injuries in the patient and the control groups were injuries of the extremities (53.6% and 39.3%, respectively), multiple injuries (22.6% and 18%) and head-neck injuries (11.9% and 25.4%). The presence and the number of fractures were significantly higher in the patient group compared to the control cases ($p=0.001$ and $p=0.005$) (Table 1).

Table 1. Comparison of the obtained data between patient and control groups.

		Patient group	Control group	p
Age (mean±SD)		31.54±12.72	30.53±13.8	**0.523**
Gender n (%)	Female	30(17.9)	45(36.9)	**0.000**
	Male	138(82.1)	77(63.1)	
The type of accident n (%)	In-vehicle	47(28)	34(27.9)	**0.350**
	Out-of-vehicle	79(47)	56(45.9)	
	Motorcycle	38(22.6)	24(19.7)	
	Bicycle*	4(2.4)	8(6.6)	
Injured body regions n (%)	Extremities	90(53.6)	48(39.3)	**0.003**
	Head-neck	20(11.9)	31(25.4)	
	Back	9(5.4)	5(4.1)	
	Abdominal	4(2.4)	5(4.1)	
	Pelvic	7(4.2)	5(4.1)	
	Thorax	-	6(4.9)	
	Multiple injuries	38(22.6)	22(18)	
Fracture n (%)	Yes	155(92.3)	73(59.8)	**0.001**
	One	77(45.8)	50(40.9)	**0.005**
	Two or more	78(46.4)	23(18.9)	
Internal organ damage n (%)	Yes	39(23.2)	16(13.1)	**0.072**
Disability ratio (mean±SD)		19.22±17.73	-	

*Since the number of injured cases was not sufficient for the comparisons, this group was not included in analysis.

The femur, tibia and/or fibula, vertebrae and radius and/or ulna were the most frequently fractured bones. Internal organ damage was present in 23.2% (39) of the cases, injury of arteries in 1.8% (3) and nerve damage (peroneal, radial, ulnar and brachial plexus) in 8.9% (15). Shortening in the lower extremities was seen in 19% (32) (1.9±1.1cm) of the cases, atrophy in the legs in 7.1% (12) (1.3±0.7cm), and atrophy in the femur in 14.3% (24) (2.9±1.3cm). 28.6% (48) of the cases experienced a walking disability of various degrees, 44.6% (75) limitation of movement and 1.2% (2) amputation (below knee and tarsometatarsal joint). Injury in the ligaments of the knee was present in 4.8% (8), malunion in the tibia in 2.98% (5), and osteomyelitis in the femur in 1.1% (2) of the cases.

Table 2. Comparison of the groups according to the SF-36 subscale scores.

	Patient group (mean±SD)	Control group (mean±SD)	p
PF	28.21±18.49	41.98±27.76	0.000
PRD	9.15±20.37	29.28±35.37	0.000
P	25.7±17.26	33.85±23.86	0.009
GH	22.77±15.77	35.82±22.25	0.000
V	24.76±18.43	37.41±21.98	0.000
SF	30.52±23.96	45.18±28.56	0.000
ERD	26.70±25.33	37.74±27.12	0.001
MH	31.03±19.37	40.47±22.10	0.000
PCSS	21.46±12.22	35.33±23.02	0.000
MCSS	28.26±15.21	40.20±19.30	0.000

ERD: emotional role disability; GH: general health; MCSS: mental component summary score; MH: mental health; P: pain; PCSS: physical component summary score; PF: physical functioning; PRD: physical role disability; SF: social functioning; V: vitality

SF-36, PCS and MCS scores were significantly lower in the patient group than the control group ($p<0.05$) (Table 2). In the patient group, the pain score was lower among women ($p=0.006$). There was no significant difference in the remaining quality of life scores between women and men in both groups ($p>0.05$). Among patients involved in in-vehicle, out-of-vehicle and motorcycle accidents, all quality of life scores with the exception of the PF were similar ($p>0.05$). PF scores of cases involved in in-vehicle accidents were significantly worse than out-of-vehicle and motorcycle accidents ($p=0.042$). In terms of injured body parts, the 8 subscale scores of SF-36 and the summary scores (PCS, MCS) were similar ($p>0.05$). However, the PRD and SF quality of life scores were significantly worse among patients with one fracture or multiple fractures ($p=0.044$ and $p=0.014$, respectively). GH scores were significantly lower among patients with organ injuries ($p=0.014$) (Tables 3 and 4).

On evaluation of the correlation between quality of life and patient age and degree of disability, only a negative correlation of borderline significance was found between age and PCS ($r=-0.162$, $p=0.036$). In addition, a significantly negative correlation of weak-medium degree was found between the degree of disability and

PF, GH, V, SF, MH, PCS and MCS scores of quality of life among patients with higher disability degrees, both physical and mental components of the quality of life were significantly worse (Table 5).

Discussion

Traffic accidents lead to physical, social and economic issues, including the withdrawal from an active life style, inability to continue one's job, being laid off and slower functions; these negative consequences impose a negative impact on both patients' mental health and quality of life.[2-14]

In a trial conducted by Andersson et al.[11] 50% of individuals injured in traffic accidents were found to experience various economic and business-related issues. Additionally, physical complaints and social issues, such as a decrease in physical functioning, decrease in work capacity, distorted financial status, decrease in social activities, disruption in relationships among family members and impairment of sexual life emerged despite a decrease in permanent physical problems.

In the literature, it was indicated that traffic accidents are most frequently encountered among men ages 30 to 40 years; accordingly, the mean age in our trial was 31.54±12.7 years and 82.1% of the subjects were men.[2-9,13,25] Possible causes for the increase in injuries due to traffic accidents among men of this age group were indicated as being involved in an active life style, being impulsive and acting less attentively due to fast decisions.

Regarding the mechanisms of accidents, Fitzharris et al. reported that 38.7% of cases were motor vehicle drivers, 9.7% passengers, 21% motorcycle riders, 25.8% bicycle riders and 4.8% pedestrians.[2] Harris et al. reported that 41.6% of cases were motor vehicle drivers, 44.8% motorcycle riders and 13.6% pedestrians.[5] Our results were in compliance with the reported findings.

The most frequently injured body parts were shown to be the extremities in studies of Borg et al. (44%),[8] Aktaş et al. (30.6%)[25] and Harris et al. (56.2%).[5] In our trial, the most frequent injuries among both cases with disabilities (53.6%) and no disabilities (39.3%) were in the extremities. This was followed by multiple body parts in the disability group (22.6%) and the head among cases with no disabilities (25.4%). In traffic accidents with no fatalities the most frequent cause of lower extremity injuries was the initial impact of the car bumper. The second most frequent injury was to the head due to a fall following impact.

Table 3. Data analysis of the patient group according to the SF-36 subscale scores.

		PF	PRD	P	GH	V	SF	ERD	MH
Gender	Female	28.00±21.52	10.83±24.28	18.80±17.02	21.50±16.66	27.33±22.69	36.41±27.20	23.30±19.84	28.4±14.86
	Male	28.26±17.85	8.78±19.50	27.20±17.00	23.04±15.61	24.20±17.41	29.2423.10	27.44±26.38	31.61±20.21
	p	**0.613**	**0.849**	**0.006**	**0.550**	**0.658**	**0.192**	**0.514**	**0.565**
Type of accident	In vehicle	23.19±15.51	7.13±17.02	26.47±17.62	20.74±15.32	24.46±18.45	29.46±22.90	23.10±22.90	30.89±21.25
	Out-of -vehicle	31.33±18.80	11.73±23.66	26.25±17.49	22.66±15.66	25.37±17.86	30.68±23.85	29.14±24.66	29.60±17.94
	Motorcycle	28.68±20.39	5.92±15.84	24.47±16.71	24.87±16.29	23.94±20.76	31.77±26.11	28.91±29.16	33.26±12.26
	p	**0.042**	**0.370**	**0.884**	**0.480**	**0.786**	**0.958**	**0.349**	**0.715**
Injured body regions	Extremities	27.56±17.37	8.24±19.88	24.98±16.72	24.67±15.91	26.66±19.03	29.85±23.97	27.65±25.60	32.47±20.08
	Head-neck	30.75±23.29	12.50±23.64	28.00±17.35	19.25±16.64	23.00±20.15	39.16±23.07	28.31±27.07	27.6±20.96
	Back	31.67±25.24	6.67±10.89	22.22±13.94	23.33±17.5	20.00±16.2	26.27±26.85	14.8±17.55	28.88±12.45
	Abdominal	13.75±4.7	6.25±12.5	25.00±10.00	21.25±19.31	20.00±17.32	28.12±18.75	33.3±0.0	28.00±9.79
	Pelvic	30.71±13.67	14.29±28.34	21.43±8.99	27.86±18.67	24.28±17.89	45.82±28.86	28.54±29.96	38.28±19.30
	Multiple	28.68±18.36	9.47±21.23	27.89±20.94	19.21±13.58	22.89±17.26	26.02±22.46	25.41±26.18	28.94±19.18
	p	**0.423**	**0.957**	**0.882**	**0.751**	**0.982**	**0.143**	**0.602**	**0.740**
Fracture	Yes	28.26±18.67	9.59±20.94	25.73±17.51	22.94±15.91	24.93±18.59	30.23±24.35	27.22±25.89	30.95±19.29
	p	**0.916**	**0.044**	**0.945**	**0.636**	**0.675**	**0.014**	**0.359**	**0.853**
Number of fractures	One	28.64±17.37	12.88±23.93	24.91±15.95	23.90±16.77	24.87±19.03	34.56±23.29	27.93±26.51	32.13±18.83
	Two or more	27.88±19.97	6.35±17.26	26.54±18.98	21.99±15.06	25.00±18.26	25.96±24.76	26.52±25.40	29.79±19.79
	p	**0.560**	**0.044**	**0.737**	**0.598**	**0.913**	**0.014**	**0.884**	**0.302**
Organ damage	Yes	26.54±17.25	11.54±20.55	26.67±19.24	17.67±15.25	21.41±17.61	28.00±22.01	26.46±21.84	30.25±17.78
	p	**0.602**	**0.180**	**0.861**	**0.014**	**0.191**	**0.541**	**0.748**	**0.877**

ERD: emotional role disability; GH: general health; MH: mental health; P: pain; PF: physical functioning; PRD: physical role disability; SF: social functioning; V: vitality

Table 4. Comparison of the patient data with summary scores.

		PCSS	MCSS
Gender	Female	19.78±15.11	28.86±14.34
	Male	21.82±11.53	28.12±15.44
	p	**0.122**	**0.872**
Type of accident	In-vehicle	19.38±9.99	26.98±13.56
	Out-of-vehicle	22.99±13.17	28.70±14.97
	Motorcycle	20.98±12.26	29.47±18.18
	p	**0.201**	**0.736**
Injured body regions	Extremities	21.36±11.81	29.16±15.81
	Head-neck	22.62±14.37	29.51±16.45
	Back	20.97±9.83	22.49±10.57
	Abdominal	16.56±7.73	27.35±10.43
	Pelvic	23.57±9.93	34.23±12.37
	Thorax	-	-
	Multiple	21.31±13.66	25.82±14.90
	p	**0.871**	**0.538**
Fracture	Yes	12.56±1.00	15.52±1.24
	p	**0.534**	**0.812**
Number of fractures	One	22.5±12.3	29.87±15.44
	Two or more	20.68±12.81	26.82±15.55
	p	**0.167**	**0.167**
Organ damage	Yes	20.57±13.41	26.53±13.71
	p	**0.285**	**0.489**

MCSS: mental component summary score; PCSS: physical component summary score

A number of trials have been conducted related to the SF-36; Kopjar[18] enrolled 775 patients between 16 and 78 years of age referred to the emergency departments. They reported that among the 469 patients who completed the SF-36, disability was present in 82 cases and all SF-36 subscale scores were low ($p<0.01$). Michaels et al.[9] reported that the eight SF-36 subscale scores were lower among patients with orthopedic injuries compared to patients with no injuries ($p<0.05$). They suggested that this finding may have been due to longer disability durations in terms of physical, psychosocial, professional and financial aspects.

Table 5. Correlation of the SF-36 scores both with age and disability ratio.

	Age		Disability ratio	
	r	p	r	p
PF	-0.108	0.163	-0.153	0.047
PRD	-0.118	0.127	-0.059	0.445
P	-0.041	0.594	-0.120	0.122
GH	-0.093	0.230	-0.231	0.003
V	-0.094	0.226	-0.0257	0.001
SF	-0.088	0.258	-0.0223	0.004
ERD	-0.047	0.545	-0.113	0.144
MH	-0.090	0.248	-0.270	0.000
PCS	-0.162	0.036	-0.193	0.012
MCS	-0.099	0.203	-0.304	0.000

ERD: emotional role disability; GH: general health; MCS: mental component summary; MH: mental health; P: pain; PCS: physical component summary; PF: physical functioning; PRD: physical role disability; SF: social functioning; V: vitality

In their trial on patients with musculoskeletal system injuries due to traffic accidents, Littleton et al.[4] investigated their health status and compensations related to work. PCS ($p<0.001$) and MCS ($p=0.007$) scores were statistically significant in the group which claimed compensation. Harris et al. reported that among patients injured in motor vehicle accidents the PCS (39.2±11.0) and MCS (44.7±13.7) mean values were lower.[5] Similar to previous trials,[4,5,8,9,13,18,22,23] we also determined that all SF-36 subscale and mental and physical summary scores were significantly lower among disabled patients than cases with no disabilities.

In the majority of our patients with disabilities due to traffic accidents, pain was referred to as the major complaint affecting daily life and as intensifying by walking or standing for longer durations. However, no correlation was found between the degree of disability and pain. This finding may be regarded as an exaggeration on the part of the patient with an expectation for a higher level of disability. On the other hand, pain scores in the patient group were poorer among women than men ($p=0.006$). Moreover, the physical component of quality of life (PCS) expressed poor scores with increasing age ($p=0.036$). Demiral et al.[23] evaluated 1,279 patients using the SF-36 survey to determine its normative and descriptive features in the Turkish population. They reported that physical health was more closely related to age and gender than mental health, general health status was lower among women than men, and social risk factors were associated with poor health profiles. Similarly, it has been indicated in a number of trials that individuals with low educational levels and increased age, especially women, have more health problems and lower physical functioning levels.[14]

We determined that PF scores of cases involved in in-vehicle accidents were poorer than those in out-of-vehicle and motorcycle accidents ($p=0.042$). Additionally, the PRD ($p=0.044$) and SF scores ($p=0.014$) of patients with single or multiple fractures as well as the GH scores of cases with organ injuries ($p=0.014$) were statistically poor. The mean disability degree of patients was 19.22±17.73% and a negative correlation was found between the increase in the degree of disability and their PF, GH, V, SF, MH, PCS and MCS scores. Furthermore, medical complaints in patient histories, examination findings and our observations also confirmed this negative correlation. In other words, with increasing disability degrees, deterioration was observed in both the mental and physical components

of quality of life. These findings support the results of previous trials.

In their trial on the long-term psychosocial implications of traffic accidents, Andersson et al.[3] evaluated patients in terms of leisure time activities, working capacity, need for help, support received, living conditions, retirement and psychosocial and injury outcomes. They determined that 68% had physical and 57% had psychological distress, 58% required help for accident-related disabilities, and 29% had to implement a change in working conditions. In conclusion, they stated that traffic accident-stricken individuals need psychological and social support, rehabilitation and social counseling, in addition to medical treatment. In our trial, we were unable to evaluate the patient and the control groups in terms of psychosocial aspects; therefore, we cannot comment on this issue, which may be regarded as a weakness of our trial.

In conclusion, there is a negative impact on the general health status and a deterioration in the quality of life among individuals involved in traffic accidents resulting in disability. In the regulation currently in use in Turkey, the degrees of disabilities are indicated only in terms of anatomical and functional limitations with no expression of a subjective concept such as pain. Therefore, we believe that the addition of items regarding the deterioration in the quality of life and pain is required and the use of the SF-36 scale would be beneficial.

Conflicts of Interest: No conflicts declared.

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