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Original Article

Validation and application of the International Classification of Functioning core set for spinal cord injury in the Turkish patients

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ABSTRACT

Objectives: The aim of this study was to apply the Comprehensive International Classification of Functioning, Disability and Health (ICF)-Core Set for spinal cord injury (SCI) -early post-acute-situation in the Turkish SCI patients and to investigate its construct validity.

Patients and methods: One-hundred and twenty patients with SCI were included in this prospective and descriptive study. ICF data were primarily collected by conducting interviews with patients as well as from their acute medical management records, physical examination findings and laboratory measurements. The percentage of participants and the frequency of the problems encountered at each level of ICF category were reported. Furthermore, the construct validity was evaluated by calculating the Spearman correlation between the ICF categories and other generic and disease specific measures.

Results: The study illustrated that 55 of the 63 ICF categories of the Component Body Functions (CBF) and each and every category for the Component Body Structures (CBS) as well as the Component Activities and Participation (CAP) were reported as a problem among the Turkish patients with SCI. Furthermore, 24 ICF categories for the Component Environmental Factors (CEF) were determined as a facilitator while 6 ICF categories were identified as a barrier. The ICF–Core Set for SCI illustrated a high construct validity with some of the generic and disease-specific measures.

Conclusion: Our results identified the common problems, complications and special needs in a Turkish population with SCI. We suggest that the application of ICF-Core Set in our patients provided us with a unique capability to assess their every aspect of disability, health and functioning.

Keywords: Construct validity; ICF-Core Set; spinal cord injury.

Spinal cord injury (SCI) is deemed to be one of the causes of a serious long-term disability due to the fact that the organ systems, as well as the body functions below the neurological lesion, may be affected. Due to SCI, SCI survivors usually manifest apparent complications and neurological deficits such as muscle weakness and atrophy, respiratory and cardiovascular problems, pressure sores, bladder, bowel and sexual dysfunctions, spasticity, depression, pain, bone loss and fracture.[1,2] These problems are associated with reduced health related quality of life (HRQL), impaired activities of daily living (ADL), poor social interactions, difficulties in returning to work and being active members of the community in varying degrees. Because SCI patients have different aspects of disability, a comprehensive evaluation and identification of problems is needed before the rehabilitation program begins. Numerous classical outcome measures to ascertain the functioning and health of patients with SCI include the Functional Independence Measure (FIM), the Ashworth Scale, the American Spinal Injury Association Impairment Scale (AIS), the Beck Depression Inventory and the Medical Outcomes Study Short Form 36 (SF-36) Questionnaire. Despite the fact that these generic and disease-specific outcome measures were used worldwide in clinical studies, they are not bio-psychosocial framework models and do not investigate every components of functioning and disability in patients with SCI.[3,4]

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The World Health Organization (WHO) established the International Classification of Functioning (ICF) and it is a very comprehensive and universally accepted model to classify and describe functioning, disability and health in all kinds of diseases or conditions.[5] Furthermore, ICF Core Sets have been developed by selecting some of the ICF categories relevant for people with a specific disease.[6] It has been reported that ICF-Core Sets serve as a guide to comprehensively evaluate and define functioning in rehabilitation program, and facilitate the planning, setting up and recording of the rehabilitation process in specific health conditions.[7] Two kinds of ICF-Core Set (brief and comprehensive) can be used for early post-acute-situation of patients with SCI.[8,9] The early post-acute context covers the first comprehensive rehabilitation after the acute SCI. The long-term context follows the early post-acute context. This definition was regarded as being applicable throughout the world irrespective of the different health systems.[8,9]

Comprehensive ICF-Core Set for SCI-early post-acute-situation contains 162 categories organized into four different components: body functions; body structures; activities and participation; and environmental factors. Although there have been some research studies conducted in various countries in this area, currently there have been no data available to date on the application of ICF-Core Set for SCI in the Turkish SCI population.

The aims of our study were to apply the Comprehensive ICF-Core Set for SCI-early post-acute-situation in the Turkish SCI patients and evaluate the characteristics of the most common problems and to investigate its construct validity. The categories in the comprehensive ICF-Core Set and the other classic generic and disease-specific measures were tested to assess construct validity.

PATIENTS AND METHODS

Participants

One-hundred and twenty patients with traumatic SCI at the early post-acute state consented to be involved in the study. These patients were admitted to the inpatient rehabilitation hospital between January 2014 and July 2016.

The criteria for exclusion included *(i)* the patients who completed the first comprehensive rehabilitation program after the acute SCI (long- term- state patients);[9] *(ii)* the patients who suffered from SCI for the reasons other than trauma; and *(iii)* the patients manifesting impaired level of gross cognitive and consciousness. The concept of early post-acute state is defined as the beginning and ending of the first comprehensive rehabilitation period after acute medical management of SCI.[8,9] The local research ethics committee approved the protocol for the study. A written informed consent was obtained from all participants.

Overview of procedures

The time since injury and the demographic features were acquired upon admission to the facility.

The subjects were interviewed and underwent a thorough medical assessment process. During this process, a physical examination was conducted within the first few days upon their admission and the patients' medical history and the necessary laboratory measurements were obtained.

Variables and instruments

The American Spinal Injury Association Impairment Scale

The injury severity was obtained using the American Spinal Injury Association Impairment Scale (AIS). This measure is a standardized examination consisting of a myotomal-based motor examination, dermatomal based sensory examination, and an anorectal examination. Based on the findings of these examinations, an injury severity or grade and level are assigned as AIS A, B, C and D.[1,2]

The neurologic level of injury

The neurological level of injury was determined for each patient. This term refers to the most caudal segment of the spinal cord with normal sensory and motor function on both sides of the body.[1,2]

The level of completeness of the lesion

The data concerning the participants' level of completeness of the lesion were recorded. The term "complete injury" is assigned on the records when there is the complete absence of sensory and motor function in the lowest sacral segments (S4-S5). The term "incomplete injury" is recorded when there is preservation of any sensory and/or motor function below the neurological level that includes the lowest sacral segments (S4-S5).[1,2]

The type of SCI Score-paraplegia versus tetraplegia

The type of SCI score was identified and recorded in the form of either paraplegia or tetraplegia for each patient. Tetraplegia refers to impairment or loss of motor and/or sensory function in the cervical

segments of the spinal cord due to damage of neural elements within the spinal canal. Tetraplegia results in impairment of function in the four extremities as well as in the trunk, legs and pelvic organs. Paraplegia refers to impairment or loss of motor and/or sensory function in the thoracic, lumbar or sacral segments of the spinal cord, secondary to damage of neural elements within the spinal canal. With paraplegia, arm functioning is spared.[1,2]

Spasticity

The severity level of spasticity was measured by the Modified Ashworth Scale (MAS). This scale consists of various velocity scores ranging from 0 to 4 with 6 options and measures resistance to passive articulated motion around a joint. A score of 4 suggests affected part(s) rigid in flexion or extension while a score of 1 implies a gradual increment in muscle tone.[10]

Functional independence measure (FIM)

This measure consists of 18 items. Five of these items are related to cognitive tasks while the other 13 measure motor tasks. The score ranges 18 to 126 predicated on the functionality level.[11] FIM is regarded as a reliable and valid measure in functional assessment of SCI patients.[4]

Depression

Depression was evaluated using the Beck Depression Inventory (BDI) which included 21 questions in respect of the patients' state of feelings. The answers to these questions are structured with four choices with varying level of intensity. Furthermore, each answer is assigned to a value between 0-3 and then the total score is compared with a key to evaluate the severity of depression (i.e. 0-9, minimal depression; 10-18, mild; 19-29, moderate; and 30-63, severe).[12]

Fatigue

The effect of excessive fatigue on the patient's daily function was evaluated employing the Fatigue Severity Scale (FSS) which incorporated nine statements in regard to fatigue. A score of 1-7 was assigned to each statement and then the total score was calculated with 9 being the lowest and 63 being the highest severity level of fatigue.[13]

Health-related quality of life (HRQL)

Health-related quality of life was measured using the Medical Outcomes Study Short Form 36 questionnaire (SF-36). The SF-36 is a commonly accepted and employed generic instrument for measuring HRQL. It assess 8 domains of health concepts by virtue of a multi-item scale. These health domains include physical functioning (PF), role limitations-physical (RP), bodily pain (BP), general health (GH), vitality (V), social functioning (SF), role limitations-emotional (RE), and mental health (MH). Furthermore, in order to reflect overall mental or physical health issues independently, these domain scores are further decomposed into two principle categories such as Physical or Mental Composite Score (PCS and MCS), respectively.

In respect of the 5 domains such as PF, RP, BP, and SF and RE, scores out of 100 were assigned. Scores of 50 were assigned for the 3 remaining domains where a higher score represented a better health status.[14,15]

ICF-core set for SCI

The Comprehensive Core Set established for the early post-acute state of SCI consists of 162 second level categories. Sixty-three of these second level categories are related to the Component Body Functions (CBF); 14 of them are associated with the Component Body Structures (CBS); 53 are in respect of the Component Activities and Participation (CAP); and finally the remaining 32 in regard to the Component Environmental Factors (CEF). [16]

A qualifier scale is employed at each level of ICF category in order to develop a total numerical score for a Core Set. A qualifier denotes the severity of a problem or the health level concerning a patient. The scale associated with the CBF, CBS and CAP incorporated 5 choices where each choice was assigned to a numerical value ranging from 0 to 4 to reflect factors such as no, mild, moderate, severe and complete problem (0 being no and 4 being a complete problem).[7,17]

The CEF can be either a barrier (i.e. negative effect on a patient's life, thus represented as a negative number between -1 to -4) or a facilitator being a positive effect and hence it was assigned a positive number between +1 to +4. In the event of no influence, a 0 value was assigned as neutral. As a result, the qualifier scale for the CEF ended up having 9 choices of response.

The response choice "8 (not specified)" was assigned if there is not enough information to determine severity of the problem while "9 (not applicable)" was selected if it is not possible or inappropriate to apply the code.

The ICF qualifiers 1 to 4 were recorded as 1 (presence of the problem) and the qualifier 0 was

recorded as absence of the problem. These choices represented as "8-not specified" and "9-not applicable" were not taken into account in the determination of the final score.

Data collection

The ICF data were primarily collected by conducting interviews with patients as well as from their acute medical management records, physical examination findings and laboratory measurements. The interviews were performed by a single physician who was trained and specialized in the areas of application and principles of the ICF. Her training activities were sponsored by the government of Turkey in collaboration of WHO in 2008.

Table 1. Sociodemographic and clinical characteristics of the patients (n=120)

	n	%	Mean±SD	Min-Max	Median	Q1-Q3
Age (year)			37.5±15.7	16-79		
Sex						
Male	85	70.8				
Female	35	29.2				
Time since injury (days)			95.4±41.6			
Type of SCI						
Tetraplegic	31	25.8				
Paraplegic	89	74.2				
Neurologic level of injury						
C2-C8	31	25.8				
T1-T6	17	14.2				
T7-T12	47	39.2				
L1-L4	25	20.8				
AIS						
AIS A	73	60.8				
AIS B	17	14.2				
AIS C	18	15				
AIS D	12	10				
Schooling						
Illiterate	14	11.7				
Basic education	3	2.5				
Moderate education	90	75				
Higher education	13	10.8				
Occupation						
Working	64	53.3				
Retired	10	8.3				
Student	21	17.5				
Not working	25	20.8				
Marital status						
Single	47	39.2				
Married	69	57.5				
Other	4	3.3				
SF-36						
PCS					26.4	22.7-31.7
MCS					45.9	35.8-53.5
BDI					16	10-25
FIM					81	70-89
FSS					4.44	2.2-5.6
MAS						
MAS 0	69	57.5				
MAS 1	26	21.7				
MAS 2	23	19.2				
MAS 3	2	1.7				

SD: Standard deviation; Min: Minimum; Max: Maximum; Q1: The first quartile. Q3: The third quartile; SCI: Spinal cord injury; AIS: American Spinal Injury Association Impairment Scale; SF-36: Short Form-36; PCS: Physical Component Summary; MCS: Mental Component Summary; BDI: Beck Depression Inventory; FIM: Functional independence measure; FSS: Fatigue Severity Scale; MAS: Modified Ashworth Scale.

Table 2. Frequency of impairments in the ICF categories of the component of body functions and the correlations with the clinical assessment scales

ICF code	Title	No	%	Neurologic level	Completeness of lesion	Type of SCI	AIS	PCS	MCS	MAS	FIM	BDI	FSS
b126	Temperament and personality functions	68	56.7	-0.09	-0.05	0.07	-0.06	-0.12	-0.60**	-0.02	-0.14	0.74**	0.57**
b130	Energy and drive functions	69	57.5	-0.22*	-0.06	0.15	-0.07	-0.18*	-0.46**	-0.04	-0.34**	0.62**	0.68**
b134	Sleep functions	69	57.5	-0.14	-0.12	0.11	-0.12	-0.24**	-0.03**	0.09	-0.19*	0.44**	0.33**
b152	Emotional functions	26	21.7	-0.14	-0.01	0.09	-0.07	-0.13	-0.37**	0.05	-0.28**	0.46**	0.45**
b260	Proprioceptive function	88	73.3	-0.19*	-0.65**	-0.10	-0.69**	-0.09	-0.07	0.11	-0.35**	0.02	-0.02
b265	Touch function	107	89.2	-0.31**	-0.42**	-0.05	-0.47**	-0.22*	-0.01	0.18*	-0.43**	0.08	0.12
b270	Sensory functions related to temperature and other stimuli	103	85.8	-0.27**	-0.48**	-0.10	-0.54**	0.26**	-0.04	0.13	-0.40**	0.13	0.16
b2800	Generalized pain	6	5	-0.17	-0.19*	0.20*	-0.18	-0.15	0.24	0.02	-0.23*	0.07	-0.10
b28010	Pain in head and neck	14	11.7	-0.28**	-0.08	0.26**	-0.09	-0.05	-0.12	-0.05	-0.24**	0.15	0.12
b28013	Pain in back	36	30	0.02	-0.08	-0.05	-0.07	-0.17	-0.06	0.08	-0.06	0.12	0.13
b28014	Pain in upper limb	14	11.7	-0.23*	0.03	0.26**	0.05	-0.06	-0.03	-0.10	-0.14	0.18*	0.16
b28015	Pain in lower limb	59	49.2	0.18*	-0.07	-0.15	-0.09	-0.28**	-0.02	-0.11	-0.05	0.01	0.10
b28016	Pain in joints	32	26.7	-0.08	0.02	0.04	0.02	-0.25**	-0.01	-0.03	-0.11	0.08	0.20*
b2803	Radiating pain in a dermatome	0	0	-	-	-	-	-	-	-	-	-	-
b2804	Radiating pain in a segment or region	12	10	0.01	-0.16	-0.08	-0.18	-0.13	0.04	-0.11	-0.06	0.04	-0.13
b310	Voice functions	32	26.7	-0.70**	0.05	0.81**	0.05	-0.13	-0.16	0.02	-0.63**	0.16	0.18*
b410	Heart functions	14	11.7	0.03	0.04	0.03	0.04	-0.10	-0.03	-0.16	-0.12	0.14	0.03
b415	Blood vessel functions	16	13.3	0.03	-0.01	-0.11	-0.03	-0.17	-0.01	-0.09	-0.09	0.07	0.09
b4200	Increased blood pressure	14	11.7	0.10	0.14	-0.03	0.14	-0.04	-0.10	-0.03	-0.06	0.03	-0.03
b4201	Decreased blood pressure	60	50	-0.43**	-0.22*	0.34**	-0.26**	-0.35**	-0.11	-0.01	-0.53**	0.19*	0.05
b4202	Maintenance of blood pressure	81	67.5	-0.49**	-0.19*	0.32**	-0.25**	-0.33**	-0.21*	0.04	-0.57**	0.32**	0.29**
b430	Hematological system functions	75	62.5	-0.21*	-0.02	0.18*	-0.03	-0.15	-0.11	-0.08	-0.26**	0.18*	0.14
b440	Respiration functions	30	25	-0.58**	-0.03	0.68**	-0.04	-0.16	-0.17	-0.03	-0.61**	0.20*	0.24**
b445	Respiratory muscle functions	65	54.2	-0.74**	-0.06	0.53**	-0.06	-0.08	-0.16	0.28**	-0.51**	0.11	0.13
b450	Additional respiratory functions	46	38.3	-0.82**	0.09	0.75**	0.07	-0.18	-0.13	0.15	-0.64**	0.12	0.11
b455	Exercise tolerance functions	115	95.8	-0.29**	-0.21*	0.23*	-0.24**	-0.35**	-0.05	0.03	-0.37**	0.28**	0.19*
b510	Ingestion functions	36	30	-0.53**	-0.02	0.61**	-0.02	-0.15	-0.12	-0.04	-0.53**	0.18*	0.13
b515	Digestive functions	1	0.08	-0.12	0.11	0.15	0.07	-0.02	-0.06	0.14	-0.07	0.07	0.05
b5250	Elimination of faeces	45	37.5	-0.03	-0.03	-0.08	-0.15	-0.17	0.02	0.14	-0.16	-0.06	-0.04
b5251	Faecal consistency	41	34.2	-0.17	-0.02	0.12	-0.13	-0.16	-0.06	0.13	-0.36**	-0.07	0.02
b5252	Frequency of defecation	70	58.3	-0.11	0.07	0.06	-0.03	-0.13	-0.03	0.14	-0.28**	0.01	0.06
b5253	Faecal continence	93	77.5	-0.15	-0.54**	-0.02	-0.66**	-0.31**	0.05	-0.01	-0.44**	-0.01	-0.08
b5254	Flatulence	69	57.5	-0.19*	-0.26**	0.11	-0.38**	-0.30**	-0.03	0.01	-0.39**	-0.05	0.02
b530	Weight maintenance functions	65	54.2	-0.21*	-0.07	0.16	-0.11	-0.08	-0.21*	-0.08	-0.34**	0.35**	0.28**

Table 2. Continued

ICF code	Title	No	%	Neurologic level	Completeness of lesion	Type of SCI	AIS	PCS	MCS	MAS	FIM	BDI	FSS
b550	Thermoregulatory functions	45	37.5	-0.55**	-0.02	0.55**	-0.04	-0.28**	-0.20*	0.02	-0.64**	0.27**	0.15
b610	Urinary excretory function	1	0.08	0.03	-0.07	0.18	-0.07	<0.01	-0.10	0.14	0.03	0.10	0.09
b6200	Urination	105	87.5	-0.23*	-0.29**	0.11	-0.40**	-0.20*	0.15	0.02	-0.48**	-0.26**	-0.15
b6201	Frequency of urination	78	65	-0.32**	-0.19*	0.19*	-0.29**	-0.24**	-0.05	0.06	-0.48**	-0.06	-0.06
b6202	Urinary continence	92	76.7	-0.23*	-0.29**	0.07	-0.42**	-0.35**	0.07	0.12	-0.51**	-0.08	-0.02
b630	Sensations associated with urinary functions	105	87.5	-0.23*	-0.27**	0.09	-0.38**	-0.21*	0.14	0.06	-0.47**	-0.24**	-0.14
b640	Sexual functions	98	81.6	-0.19*	-0.44**	0.15	-0.52**	-0.33**	0.07	-0.05	-0.37**	0.15	0.07
b670	Sensations associated with genital and reproductive functions	12	10	-0.03	-0.14	-0.03	-0.20*	-0.23*	-0.03	-0.12	-0.19*	0.21*	0.21*
b710	Mobility of joint functions	45	37.5	-0.15	-0.01	0.02	-0.01	-0.28**	-0.02	0.09	-0.16	0.22*	0.25**
b7300	Power of isolated muscles and muscle groups	18	15	-0.01	0.05	-0.03	0.06	-0.06	0.05	0.06	0.07	-0.02	-0.15
b7302	Power of muscles of one side of the body	0	0	-	-	-	-		-	-	-	-	
b7303	Power of muscles in lower half of the body	80	75	0.48**	-0.29**	-0.83**	-0.32**	-0.02	0.15	0.06	0.32**	-0.06	-0.03
b7304	Power of muscles of all limbs	31	25.8	-0.78**	0.17	0.95**	0.18*	-0.11	-0.15	0.06	-0.53**	0.12	0.16
b7305	Power of muscles of the trunk	72	60	-0.65**	-0.13	0.47**	-0.17	-0.11	-0.17	0.18*	-0.43**	0.17	0.08
b7353	Tone of muscles of lower half of body	59	49.2	-0.01	-0.11	-0.33**	-0.17	-0.08	0.03	0.42**	0.01	-0.05	0.03
b7354	Tone of muscles of all limbs	14	11.7	-0.38**	0.18*	0.50**	0.20*	-0.14	0.12	0.43**	-0.18*	-0.11	-0.08
b7355	Tone of muscles of trunk	34	28.3	-0.29**	-0.02	0.02	-0.06	0.01	0.05	0.46**	-0.09	-0.09	-0.08
b740	Muscle endurance functions	118	98.3	-0.28**	-0.27**	0.10	-0.34**	-0.41**	0.05	0.09	-0.40**	0.04	0.17
b750	Motor reflex functions	103	85.8	-0.19*	-0.36**	0.02	-0.44**	-0.33**	-0.03	0.07	-0.03**	0.09	0.17
b755	Involuntary movement reaction functions	109	90.8	-0.15	-0.38**	0.01	-.049**	-0.45**	0.07	0.01	-0.42**	0.01	0.08
b760	Control of voluntary movement function	103	85.8	-0.149	-0.39**	0.06	-0.49**	-0.24**	-0.02	-0.09	-0.44**	0.12	0.08
b765	Involuntary movement functions	36	30	-0.15	0.01	0.02	-0.02	-0.01	0.06	0.57**	-0.05	-0.17	-0.07
b770	Gait pattern functions	105	95.8	-0.34**	-0.22*	0.29**	-0.32**	-0.34**	-0.01	0.04	-0.06**	-0.01	0.05
b780	Sensations related to muscles and movement functions	42	35	-0.11	0.02	-0.04	-0.03	-0.07	-0.01	0.57**	-0.03	-0.09	-0.01
b810	Protective functions of the skin	57	47.5	-0.36**	-0.25**	0.22*	-0.27**	-0.17	-0.05	0.02	-0.39**	0.11	-0.03
b820	Repair functions of the skin	56	46.7	-0.34**	-0.26**	0.20*	-0.29**	-0.17	-0.06	0.01	-0.38**	0.13	-0.01
b830	Other functions of the skin	3	2.5	-0.12	-0.13	0.14	-0.12	-0.06	-0.06	-0.05	-0.13	0.10	0.01
b840	Pain in back	3	2.5	0.06	-0.13	-0.09	-0.12	-0.06	0.10	0.07	0.04	0.02	-0.08

ICF: International Classification of Functioning; SCI: Spinal cord injury; AIS: American Spinal Injury Association Impairment Scale; PCS: Short Form-36 Physical Component Summary; MCS: Short Form-36 Mental Component Summary; MAS: Modified Ashworth Scale; FIM: Functional Independence Measure; BDI: Beck Depression Inventory; FSS: Fatigue Severity Scale; No (%): number of patients reporting the impairment for the corresponding ICF category, The values are presented in no (%) and Spearman r * $p<0.05$; ** $p<0.01$.

Table 3. Frequency of impairments in the ICF categories of the component of body structures and the correlations with the clinical assessment scales

ICF code	Title	No	%	Neurologic level	Completeness of lesion	Type of SCI	AIS	PCS	MCS	MAS	FIM	BDI	FSS
s12000	Cervical spinal cord	31	25.8	-0.79**	0.17	0.99**	0.19*	-0.08	-0.18*	-0.01	-0.55**	0.15	0.15
s12001	Thoracic spinal cord	71	59.2	0.18	-0.31**	-0.06**	-0.34**	-0.06	0.03	0.13	0.16	0.01	-0.01
s12002	Lumbosacral spinal cord	39	32.5	0.64**	0.13	-0.41**	0.11	-0.15	0.15	-0.22*	0.29**	-0.09	-0.09
s12003	Cauda equina	14	11.7	0.49**	0.33**	-0.22*	0.32**	0.14	0.12	-0.10	0.27**	-0.23*	-0.19*
s1201	Spinal nerves	118	98.3	-0.09	-0.04	0.07	-0.03	-0.14	-0.09	-0.13	-0.21*	-0.01	0.04
s430	Structure of respiratory system	59	49.2	-0.50**	0.06	0.42**	0.01	-0.17	-0.18*	0.15	-0.49**	0.15	0.24**
s610	Structure of urinary system	98	81.7	-0.15	-0.32**	0.01	-0.41**	-0.20*	0.01	-0.05	-0.37**	0.03	0.07
s710	Structure of head and neck region	31	25.8	-0.64**	0.12	0.74**	0.11	-0.11	-0.15	0.01	-0.59**	0.18*	0.21*
s720	Structure of shoulder region	25	20.8	-0.17	-0.09	-0.02	-0.07	-0.06	-0.10	0.09	0.01	0.12	0.23*
s730	Structure of upper extremity	26	22.7	-0.51**	-0.002	0.62**	0.01	-0.18	-0.09	-0.04	-0.44**	0.17	0.18*
s740	Structure of pelvic region	47	39.2	-0.32**	-0.12	0.19*	-0.16	-0.18*	-0.12	-0.03	-0.39**	0.20*	0.06
s750	Structure of lower extremity	61	50.8	-0.29**	0.03	0.16	-0.01	-0.20*	-0.17	0.06	-0.40**	0.25**	0.14
s760	Structure of trunk	120	100	-0.06	-0.13	-0.05	-0.15	-0.22*	-0.03	-0.04	-0.18	0.13	0.08
s810	Structure of areas of skin	59	49.2	-0.33**	-0.24**	0.19*	-0.28**	-0.19*	-0.04	0.03	-0.37**	0.10	0.03

ICF: International Classification of Functioning; SCI: Spinal cord injury; AIS: American Spinal Injury Association Impairment Scale; PCS: Short Form-36 Physical Component Summary; MCS: Short Form-36 Mental Component Summary; MAS: Modified Ashworth Scale; FIM: Functional Independence Measure; BDI: Beck Depression Inventory; FSS: Fatigue Severity Scale; No (%): number of patients reporting the impairment for the corresponding ICF category; The values are presented in no (%) and Spearman r * $p<0.05$; ** $p<0.01$.

Statistical analysis

SPSS 15.0 statistical software (SPSS Inc., Chicago, IL, USA) was used in carrying out the statistical analyses. Descriptive statistics were employed to determine the demographic and clinic characteristics of the population as well as to establish the general status of their health using the SF-36. The results for descriptive statistics were expressed as mean±SD for continuous variables, and median and quartiles for ordinal variables. The Chi-square test was utilized to establish the categorical data. The percentage of participants and the frequency of the problems encountered at each level of ICF category were reported. The frequency and percentage of persons who reported a specific ICF category either as a barrier or facilitator were also calculated concerning the CEF.

In order to evaluate construct validity of the ICF-Core Set, Spearman correlation coefficients were calculated between the categories in the comprehensive ICF-Core Set and the others such as AIS, SF-36, FIM, BDI, FSS and MAS.

RESULTS

The study included a consecutive sample of 120 patients with SCI, of which 70, 8% were male. The mean age ± standard deviation (SD) was 37.5±15.7 years while the mean time from SCI onset to the first evaluation was 95.4±41.6 days. The clinical and demographic characteristics of the patients are illustrated in Table 1.

Concerning the CBF, the participants reported problems in relation to 55 of the 63 ICF categories. Frequency of impairments in the ICF categories of the component of body functions and the correlations with the other clinical assessment scales are showed in Table 2.

As far as the CBS is concerned, the patients reported problems in all categories. Table 3 shows frequency of impairments in the ICF categories of the component of body structures and the correlations with the AIS, SF-36, MAS, FIM, BDI and FSS scales.

All the ICF categories were also documented as the common problems experienced by individuals for the CAP. Frequency of impairments in the ICF categories of the component of activities and participation and the correlations with the other clinical assessment scales are showed in Table 4.

With regard to the CEF, 6 CEF categories were ascertained as a barrier while 24 categories were

Table 4. Frequency of impairments in the ICF categories of the component of activities and participation and the correlations with the clinical assessment scales

ICF code	Title	No	%	Neurologic level	Completeness of lesion	Type of SCI	AIS	PCS	MCS	MAS	FIM	BDI	FSS
d230	Carrying out daily routine	65	54.2	-0.27**	-0.17	0.20*	-0.20*	-0.23*	-0.33**	0.06	-0.38**	0.58**	0.39**
d240	Handling stress and other psychological demands	61	50.8	-0.14	-0.02	0.16	-0.02	-0.04	-0.47**	0.01	-0.19*	0.74**	0.51**
d360	Using communication devices and techniques	37	30.8	-0.73**	0.05	0.83**	0.06	-0.15	-0.19*	0.06	-0.58**	0.23*	0.18*
d4100	Lying down	23	19.2	-0.54**	-0.14	0.64**	-0.16	-0.29**	-0.03	-0.06	-0.62**	0.12	0.01
d4103	Sitting	46	38.3	-0.43**	-0.12	0.42**	-0.17*	-0.41**	-0.04	-0.04	-0.66**	0.07	0.09
d4104	Standing	78	65	-0.37**	-0.29**	0.21*	-0.38**	-0.43**	-0.08	0.05	-0.56**	0.14	0.12
d4105	Bending	116	96.7	-0.13	-0.38**	-0.04	-0.48**	-0.38**	0.05	0.08	-0.37**	0.02	0.05
d4106	Shifting the body's centre of gravity	111	92.5	-0.08	-0.38**	-0.08	-0.51**	-0.35**	0.09	0.04	-0.36**	-0.05	-0.01
d4153	Maintaining a sitting position	59	49.2	-0.49**	-0.17	0.36**	-0.24**	-0.39**	-0.13	0.07	-0.65**	0.16	0.12
d4154	Maintaining a standing position	108	90	-0.34**	-0.40**	0.18*	-0.52**	-0.39**	0.02	0.11	-0.58**	0.03	0.06
d420	Transferring oneself	72	60	-0.42**	-0.17	0.39**	-0.24**	-0.49**	-0.05	0.07	-0.64**	0.22*	0.12
d430	Lifting and carrying objects	119	99.2	-0.28**	-0.39**	0.14	-0.47**	-0.39**	0.05	0.16	-0.40**	0.16	0.17
d435	Moving objects with lower extremities	114	95	-0.17	-0.31**	0.04	-0.44**	-0.37**	0.07	0.06	-0.49**	-0.06	-0.02
d4400	Picking up	29	24.2	-0.75**	0.14	0.95**	0.16	-0.09	-0.14	-0.01	-0.51**	0.13	0.11
d4401	Grasping	26	21.7	-0.70**	0.12	0.89**	0.11	-0.14	-0.08	-0.01	-0.58**	0.10	0.04
d4402	Manipulating	29	24.2	-0.68**	0.10	0.86**	0.12	-0.11	-0.09	-0.11	-0.54**	0.09	0.02
d4403	Releasing	25	20.8	-0.68**	0.09	0.86**	0.09	-0.17	-0.06	-0.04	-0.64**	0.07	0.06
d4450	Pulling	28	22.7	-0.70**	0.16	0.88**	0.18*	-0.11	-0.09	-0.04	-0.53**	0.08	0.05
d4451	Pushing	29	24.2	-0.65**	0.15	0.81**	0.15	-0.17	-0.07	-0.11	-0.53**	0.14	0.08
d4452	Reaching	27	22.5	-0.69**	0.14	0.86**	0.16	-0.12	-0.08	-0.07	-0.56**	0.08	0.02
d4453	Turning or twisting the hands or arms	34	28.3	-0.70**	0.17	0.87**	0.17	-0.13	-0.12	-0.08	-0.48**	0.19*	0.13
d4455	Catching	34	28.3	-0.75**	0.15	0.94**	0.17	-0.07	-0.16	0.01	-0.48**	0.14	0.10
d4500	Walking short distances	94	78.3	-0.43**	-0.29**	0.21*	-0.40**	-0.38**	0.01	0.18*	-0.59**	0.05	0.03
d4501	Walking long distances	110	91.7	-0.32**	-0.41**	0.06	-0.51**	-0.31**	0.08	0.28**	-0.42**	-0.05	-0.04
d4502	Walking on different surfaces	61	95.3	-0.21*	-0.31**	-0.03	-0.42**	-0.31**	0.11	0.22*	-0.39**	-0.11	-0.07
d4503	Walking around obstacles	59	93.6	-0.25**	-0.32**	-0.01	-0.32**	-0.29**	0.06	0.25**	-0.38**	-0.07	-0.03
d455	Moving around	108	90	-0.21*	-0.30**	-0.04	-0.30**	-0.31**	0.13	0.24**	-0.35**	-0.13	-0.09
d4600	Moving around within the home	22	75.8	-0.46**	-0.31**	0.20*	-0.31**	-0.02	0.74**	0.20*	-0.59**	0.08	<0.01
d4601	Moving around within buildings other than home	25	83.3	-0.41**	-0.29**	0.17	-0.28**	<0.01	0.72**	0.23*	-0.60**	-0.02	-0.06
d4602	Moving around outside the home and other buildings	19	90.5	-0.33**	-0.25**	0.08	-0.35**	0.02	0.54**	0.23*	-0.54**	-0.03	-<0.01
d465	Moving around using equipment	29	30.2	-0.62**	0.09	0.73**	0.06	-0.18*	0.27**	0.06	-0.59**	0.25**	0.19*
d470	Using transportation	26	86.7	-0.25**	-0.48**	0.07	-0.57**	0.09	0.64**	0.14	-.36**	0.04	0.02
d475	Driving	21	95.4	-0.04	-0.37**	-0.05	-0.46**	0.11	0.49**	0.05	-0.21*	0.04	0.01
d510	Washing oneself	111	92.5	-0.24**	-0.47**	0.15	-0.56**	<0.01	0.57**	0.01	-0.34**	0.22*	0.15

Table 4. Continued

ICF code	Title	No	%	Neurologic level	Completeness of lesion	Type of SCI	AIS	PCS	MCS	MAS	FIM	BDI	FSS
d520	Caring for body parts	104	86.7	-0.32**	-0.39**	0.20*	-0.48**	-0.03	0.63**	0.03	-0.51**	0.17	0.15
d5300	Regulating urination	66	55	-0.46**	-0.17	0.34**	-0.25**	-0.12	0.43**	0.09	-0.62**	0.13	0.09
d5301	Regulating defecation	94	78.3	-0.27**	-0.52**	0.07	-0.63**	0.02	0.60**	0.03	-0.45**	0.10	0.06
d5302	Menstrual care	17	48.6	-0.18	-0.16	0.19*	-0.18*	-0.06	0.08	0.06	-0.22*	-0.03	0.10
d540	Dressing	103	85.8	-0.27**	-0.21*	0.19*	-0.21*	-0.03	0.48**	-0.04	-0.44**	0.21*	0.17
d550	Eating	23	19.2	-0.65**	0.05	0.82**	0.05	-0.06	0.26**	-0.05	-0.63**	0.09	0.08
d560	Drinking	23	19.2	-0.65**	0.05	0.82**	0.05	-0.06	-0.26**	-0.05	-0.63**	0.09	0.08
d570	Looking after one's health	50	41.7	-0.28**	-0.15	0.29**	-0.15	-0.19*	-0.33**	-0.02	-0.44**	0.47**	0.34**
d610	Acquiring a place to live	8	61.5	-0.33**	-0.20*	0.34**	-0.20*	-0.14	0.48**	-0.04	-0.54**	0.35**	0.17
d620	Acquisition of goods and services	25	89.3	-0.13	-0.35**	0.16	-0.34**	0.14	0.47**	-0.09	-0.33**	0.03	0.02
d630	Preparing meals	28	90.3	-0.20*	-0.31**	0.17	-0.31**	0.05	0.44**	-0.06	-0.34**	0.07	0.02
d640	Doing housework	11	91.7	-0.25**	-0.36**	0.25**	-0.36**	0.08	0.48**	-0.09	-0.38**	0.06	0.05
d660	Assisting others	26	76.5	-0.15	-0.29**	0.11	-0.29**	-0.03	0.54**	-0.08	-0.37**	0.07	0.07
d760	Family relationships	27	24.5	-0.09	-0.05	0.04	-0.05	-0.29**	0.01	0.01	-0.13	0.26**	0.10
d770	Intimate relationships	33	35.5	0.10	-0.09	-0.11	-0.08	-0.01	-0.18*	-0.05	-0.05	0.06	-0.01
d850	Remunerative employment	60	93.7	-0.13	-0.37**	0.13	-0.37**	0.05	0.30**	-0.13	-0.33**	0.11	0.08
d870	Economic self-sufficiency	79	65.8	0.07	-0.24**	-0.096	-0.24**	0.02	0.08	-0.06	0.03	<0.01	-0.02
d920	Recreation and leisure	21	95.4	0.01	-0.32**	0.08	-0.32**	0.07	0.24**	-0.22*	-0.28**	0.15	0.16
d930	Religion and spirituality	30	50	-0.38**	-0.19*	0.41**	-0.19*	-0.08	0.38**	0.02	-0.47**	0.18*	0.134

ICF: International Classification of Functioning; SCI: Spinal cord injury; AIS: American Spinal Injury Association Impairment Scale; PCS: Short Form-36 Physical Component Summary; MCS: Short Form-36 Mental Component Summary; MAS: Modified Ashworth Scale; FIM: Functional Independence Measure; BDI: Beck Depression Inventory; FSS: Fatigue Severity Scale; No (%): number of patients reporting the impairment for the corresponding ICF category, the values are presented in no (%) and Spearman r * $p<0.05$; ** $p<0.01$.

Table 5. Frequency of a barrier, facilitator or both in the ICF categories of the component environmental factors and the correlations with the clinical assessment scales

ICF code	Title	No	%	Neurologic level	Completeness of lesion	Type of SCI	AIS	PCS	MCS	MAS	FIM	BDI	FSS
e110	Products or substances for personal consumption	93	77.5	-0.26**	-0.11	0.175	-0.13	-0.11	-0.02	0.02	-0.22*	-0.04	-0.03
e115	Products and technology for personal use in daily living	110	91.6	0.28**	0.01	-0.32**	-0.01	0.15	0.22*	-0.10	0.26**	-0.27**	-0.13
e120	Products and technology for personal indoor and outdoor mobility and transportation	110	91.6	-0.07	-0.25**	-0.04	-0.32**	-0.24*	0.03	0.15	-0.15	0.01	0.05
e125	Products and technology for communication	40	62.5	0.40**	-0.15	-0.49**	-0.21*	-0.17	0.10	0.01	0.22*	<0.01	-0.03
e130	Products and technology for education	16	21.3	0.20*	-0.22*	-0.17	-0.23**	0.01	-0.01	-0.09	0.12	0.04	-0.09
e135	Products and technology for employment	NA	-	-	-	-	-	-	-	-	-	-	-
e140	Products and technology for culture, recreation and sport	13	19.4	0.12	0.03	-0.09	0.01	0.06	0.07	-0.03	0.10	0.03	-0.06
e150	Design, construction and building products and technology of buildings for public use	84	70	-0.21*	-0.07	0.34**	-0.09	-0.25**	0.02	-0.11	-0.32**	0.14	0.04
e155	Design, construction and building products and technology of buildings for private use	87	72.5	-0.29**	-0.20*	0.32**	-0.27**	-0.32**	0.16	0.06	-0.41**	-0.02	-0.01
e165	Assets	95	79.1	0.03	-0.19*	0	-0.18	-0.05	0.09	-0.18*	-0.05	0.02	-0.16
e310	Immediate family	107	89.2	-0.14	0.01	0.07	-0.07	-0.20*	0.23*	0.04	-0.26**	-0.21*	-0.12
e315	Extended family	76	63.3	-0.01	0.21*	0.13	0.19*	-0.12	-0.04	-0.01	0.01	0.09	0.03
e320	Friends	43	40.6	0.11	0.06	0.02	0.04	-0.04	0.09	-0.10	0.04	<0.01	-0.22*
e325	Acquaintances, peers, colleagues, neighbors and community members	23	24.5	-0.01	0.22*	0.07	0.19*	-0.04	-0.03	0.03	0.02	0.05	-0.03
e330	People in positions of authority	35	39.3	-0.14	0.04	0.12	0.05	-0.12	-0.03	-0.16	-0.15	0.23**	0.12
e340	Personal care providers and personal assistants	26	32.9	0.17	-0.06	-0.16	-0.12	0.11	-0.03	-0.06	0.02	0.08	0.04
e355	Health professionals	88	73.4	-0.05	0.08	-0.02	0.06	-0.01	-0.14	0.04	-0.16	0.03	-0.09
e360	Other professionals	6	9.2**	0.15	0.09	-0.07	0.03	-0.17	0.19*	-0.04	0.04	-0.20*	-0.17
e410	Individual attitudes of immediate family members	89	74.2	-0.13	0.04	0.12	0.03	-0.18*	0.07	0.02	-0.22*	0.01	-0.10
e415	Individual attitudes of extended family members	65	54.1	-0.07	0.05	0.19*	0.04	-0.17	-0.06	-0.04	-0.11	0.09	-0.03
e420	Individual attitudes of friends	39	36.8	0.11	0.12	-0.02	0.12	0.09	0.06	0.02	0.13	0.06	-0.16
e425	Individual attitudes of acquaintances, peers, colleagues, neighbors and community members	19	20.2	0.03	0.20*	0.01	0.16	-0.01	0.09	0.02	0.09	-0.07	-0.24**
e440	Individual attitudes of personal care providers and personal assistants	20	25.3	0.06	0.06	-0.04	0.03	-0.01	-0.03	-0.11	-0.01	0.04	-0.08
e450	Individual attitudes of health professionals	81	67.5	-0.07	0.15	0.14	0.14	-0.07	-0.06	-0.01	-0.10	-0.01	-0.19*
e460	Societal attitudes	38	73.1	-0.08	0.10	0.09	0.09	-0.10	-0.21*	-0.04	-0.08	0.17	0.09
e515	Architecture and construction services, systems and policies	84	72.4	-0.22*	-0.11	0.28**	-0.14	-0.19*	-0.02	-0.05	-0.29**	0.11	-0.06
e525	Housing services, systems and policies	28	39.4	0.06	-0.02	-0.03	-0.01	0.09	0.10	0.07	0.06	-0.08	-0.07
e540	Transportation services, systems and policies	86	83.5	-0.18*	-0.01	0.17	-0.04	-0.18*	0.06	0.03	-0.20*	0.11	-0.05
e555	Associations and organizational services, systems and policies	11	22.4	-0.07	0.31**	0.17	0.26**	0.07	-0.10	-0.01	-0.01	-0.05	-0.11

Table 5. Continued

ICF code	Title	No	%	Neurologic level	Completeness of lesion	Type of SCI	AIS	PCS	MCS	MAS	FIM	BDI	FSS
e570	Social security services, systems and policies	109	90.8	-0.12	-0.13	-0.04	-0.19*	-0.22*	-0.08	-0.01	-0.19*	0.08	0.15
e575	General social support services, systems and policies	103	85.8	-0.15	-0.01	0.05	-0.06	-0.12	-0.15	0.06	-0.18*	0.11	0.14
e580	Health services, systems and policies	111	92.5	-0.09	-0.12	-0.06	-0.20*	-0.25**	-0.05	-0.01	-0.24**	0.01	0.08

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reported as a facilitator by the patients. Table 5 shows frequency of a barrier, facilitator or both in the ICF categories of the component environmental factors and the correlations with the AIS, SF-36, MAS, FIM, BDI and FSS scales.

DISCUSSION

The study illustrated that the Turkish traumatic SCI patients reported significant problems in all categories of CBS and CAP while in 55 categories of 63 CBF. Furthermore, 6 categories of the CEF were determined as a barrier while 24 of them as a facilitator.

The high manifestation of typical impairments in CBF (i.e. sensory functions and pain, defecation, urination and sexual functions, and neuromusculoskeletal and movement-related functions) was not deemed to be a surprise and consistent with the previous studies.[18-20]

About 76, 7% of the Turkish patients presented problem in the category of b280 sensation of pain. However, the intensity; duration; aggravating and relieving factors; frequency and the type of pain could not be ascertained when applying the ICF. Pain in lower limb (b28015) was the most frequently reported impairment in this category. The appearance of post-SCI pain varied between 11% and 94%.[21,22] The pain can be nociceptive, neuropathic, or visceral in this population. Nociceptive is the most common and can be due to the initial trauma, muscle and joint overuse, injury-related muscle weakness, spasm, and contractures.[23] The post-SCI pain can be severe, and significantly affect physical activity and wellbeing.[1,2] During the rehabilitation program, pain assessment and its modification must play a critical role. b260, b265 and b270 categories in chapter 2 that assess sensory functions were also impaired in more than 70% of our patients. Our findings were supported by the previous studies in the literature.[18,20]

Numerous cardiovascular problems that are directly linked with autonomic dysfunction including cardiac arrhythmias, autonomic dysreflexia and orthostatic hypotension were extensively reported in SCI. Arterial blood pressure at rest is notably lower in SCI than that of able-bodied individuals due to the reduced sympathic-nervous-system activities below the injury level. Orthostatic hypotension can also occur in SCI due to altered sympathetic response to posture changes, decreased vascular tone, and decreased venous return.[24,25] With this as background knowledge, the b4204 category (i.e. maintenance of

blood pressure) was impaired in 67.5% while the b4201 category (i.e. decreased blood pressure) was identified in about 50% of our patients.

b5253 faecal continence and b5252 frequency of defecation were reflected as a problem by the patients 77, 5% and 58, 3%, respectively. Severe constipation and fecal incontinence are commonly observed due to bowel dysfunction associated with SCI. Bowel dysfunction can adversely affect one's social and work life, educational activities and constitute a major impediment to HRQL, community integration and independence post-SCI.[26] Thus, it should be investigated and identified systematically.

Another important cause of mortality and morbidity in SCI patients is identified as respiratory dysfunction.[27,28] The main causes for respiratory dysfunction and complications reported in SCI population can be listed as reduced chest wall and lung compliance; increased secretions and bronchial tone; impaired cough; and denervation of the respiratory pump (reduced respiratory muscle force and fatigue).[27,28] In our study, b440 and b445 were documented as the problem experienced by individuals 25% and 54, 2%. Previous studies reported b445 as a problem between 37%[18] and 62, 2%.[20] Furthermore, pulmonary function test and chest X-ray evaluations showed that the frequency of problem in the structure of respiratory system (s430) was 49, 2%. This result was higher than the values reported in the previous literatures.[19,20]

The category of b455 (i.e. exercise tolerance function) identified as a problem in about 95, 8% of the Turkish patients. Marked deconditioning and physical inactivity are commonly observed among the SCI patients because of the motor loss below the injury level. It appears that activities of daily living with the remaining muscle mass are not sufficient to maintain exercise tolerance. Marked inactivity in SCI has been associated with excessive reductions in aerobic fitness.[29]

Bladder dysfunction is another problem seen in more than 80% of SCI patients. Some complications associated with this condition are renal impairment, stones, urinary tract infection, incontinence, poor HRQL, etc.[1,30] Furthermore, reduced fertility potential and sexual function are commonly observed due to the significant changes in their somatic and autonomic nervous systems after SCI.[31] Therefore, it might not be surprising that b6200 urination, b6201 frequency of urination, b6202 urinary continence, b630 sensations associated with urinary functions and b640 sexual functions were reflected as problems over 75% of our patients. Furthermore, urinary complications cause upper and lower urinary tract deterioration in these population. The second most common structural problem observed (about 81, 3% among the patients) was the structure of the urinary system (s610) in consistent with the existing literature. Laboratory studies such as urodynamic and ultrasonography evaluation showed that the most common problem was in the structure of the bladder (s6102) as a third -level ICF category.

One of the most common complications of SCI can be identified as pressure ulcers. About 33% of the patients develop pressure ulcers during their initial rehabilitation.[1] The frequency of the problem in protective functions of the skin (b810) was 48% and repair functions of the skin (b820) was 46% of our patients. Furthermore, the structure of areas of skin (s810) was identified as a problem in 49, 2% of our patients. These findings were in line with the other studies.[18,20]

Loss of sensation and complete loss of muscle function or weakness in the body below the level of injury are common results caused by SCI. Mobility and voluntary movement limitations are well known main characteristics in SCI.[1,2] Thus, it is not surprising that the most prevalent impairments in our study were seen in chapter b7 neuromusculoskeletal and movement-related functions. In this chapter, 37, 5% to 100% of patients reported problems in all categories. This result was consistent with the two previous studies in the area of impairments of patients with SCI.[18,20] Structure of the spinal cord and related structures (s120), consistent with the main organ systems involved by SCI, were identified as a problem in 100% of the Turkish patients. Again this outcome was in agreement with the results of the previous studies.[18,20]

In our study, the structure of the trunk (s760) was documented as a problem experienced by individuals 99, 2% of the patients. The most frequent problem in this category was found in the structure of the vertebral column (s7600). Other structures related to movement (s710, s720, s730, s740 and s750) were also reflected as problems because of atrophy, fractures and deviating position.

Concerning the CAP, the fundamental problems were seen in some of the categories in the chapters d4 mobility, d5 self-care, d6 domestic life, d8 major life areas and d9 community, social and civic life which were reflected by more than 85% of the participants.

In our study, the limitations associated with mobility and self-care have emerged as the most crucial impediments for these patients. As SCI causes significant neurologic impairments below the lesion level, patients with SCI are dependent even in such basic activities of eating, dressing, bathing, grooming, toileting, and transfers and mobilizing.[1,2] After the injury, neurologic recovery usually occurs in the first 3-6 months, and the condition a year after the injury generally remained unchanged in all cases, regardless of the extent of injury.[32,33] The SCI population was determined to be in the early post-acute period during the study. The patient's functional outcome may vary with neurologic recovery, the prevention and treatment of the associated complications, and the amount of rehabilitation training. Therefore, we suggest that the problem in the CAP may be less prevalent in the long-term period.

A significant element of rehabilitation interventions for these patients is improvement of ADL, mobility activities, personal care skills and ambulation. A critical measure of rehabilitation success for SCI patients is the level of patient's independence in these type of activities. Therefore, it is imperative to develop a set of guidelines which would comprehensively assess and define potential problems of activities and participation prior to the rehabilitation program.

As far as the CEF are concerned, the most frequent facilitators (specified by more than 85% of the participants) were e115 (products and technology for personal use in daily living), e120 (products and technology for personal indoor and outdoor mobility and transportation), e310 (Immediate family), e570 (social security services, systems and policies), e575 (general social support services, systems and policies) and e580 (health services, systems and policies).

In contrast to the previous literatures, most of the categories within chapter e3 (support and relationships) and e4 (attitudes) were not reported as facilitators by our patients.[18,20] Currently, our country offers only a few optimal comprehensive rehabilitation centers equipped with complete units, services and capabilities. Our academic hospital is located in Ankara and is the largest inpatient rehabilitation center providing comprehensive rehabilitation services in Turkey. Most of our patients are required to travel to our center from their own towns and cities and they can only be accepted with a company of maximum of one family member. Our patients are away from their extended family members, friends, colleagues and neighbors during the first rehabilitation period. Therefore, we suggest that it is difficult to evaluate the real frequency of impairments in the categories of e3 and e4 in our study population.

The most frequently reported barriers were e150 (design, construction and building products and technology of buildings for public use), e155 (design, construction and building products and technology of buildings for private use), e515 (architecture and construction services, systems and policies) and e540 (transportation services, systems and policies). These categories were identified by more than 70% of our patients as barriers. Although there have been noticeable developments and improvements in the areas of urban planning and municipal services, they are far from the optimal for disabled people, especially in the small cities, towns and villages. It is not surprising that most frequently reported barriers are in these categories, as most of our patients live in the small cities, towns, and villages, and some of whom are working as farmers in these villages.

The results of the present study generally manifested that our findings (i.e. specific percentages of the surrounding health problems and complications) determined by the Comprehensive ICF Core set for SCI-early post-acute situation were typically in line with and as accurate as the findings reported in the SCI literature using different outcome measures. In our study, the Comprehensive Core Set for SCI-early post-acute situation showed a high construct validity with FIM, neurologic level of injury, level of completeness of the lesion, AIS and the type of SCI, respectively. Ninety-four categories of the ICF core set for SCI-early post-acute situation had correlations with FIM, 90 categories with neurologic level of injury, 81 categories with level of completeness of the lesion, 79 with AIS and 73 with the type of SCI. Furthermore, we found that components of body functions and activities and participation showed higher construct validity with generic and disease-specific scales than the components of body structures and environmental factors. The facts that the ICF Core set for SCI-early post-acute situation identified more than 70% problems in some of the categories of the environmental factors and body structures, and also there exists a significantly low level correlation between these categories and the traditional disease-specific and generic outcome measures, suggest the classical outcome measures failed to ascertain all aspects of disability, functioning and health of patients with SCI. This finding stresses the value of the Comprehensive Core Set for SCI-early post-acute situation.

The study has some limitations. The data were collected from only one source a single rehabilitation hospital in Ankara and this may lead to criticism of that the data were not being true representation of the general Turkish SCI patients. However, our rehabilitation hospital is the largest inpatient rehabilitation center and accepts patients from every province and region in Turkey. Therefore, we can claim with a high confidence that the current sample represents the true nature of the SCI population in Turkey.

It may also be noticed in our patients' records that there subsists some delays up to 30-45 days between the completion of acute medical management and the subsequent admission of patients into a rehabilitation hospital and commencement of the first rehabilitation program activity. This is mostly due to the fact that there is a limited number of rehabilitation hospitals which provide a full comprehensive rehabilitation service in the country and also due to the limited number of available hospital beds.

Finally, although qualifiers determine the relevant level of health or severity of the problem and are represented as 5 different response options, in our study, the ICF qualifiers only indicated the presence (qualifiers 1 to 4) or absence (qualifier 0) of a problem.

Various aspects of health and disability in patients with SCI have traditionally been described with single dimensional generic and disease- specific measures in rehabilitation medicine. This description potentially could give rise to the following well known problems:

-selection of improper or incomplete set of measures prior to the commencement of the rehabilitation program which in turn giving rise to an improper and/or incomplete analysis, evaluation and assessment;

- use of simultaneous and different specific and generic measures leading to a very time consuming process; and

- the lack of a standard terminology among the healthcare professionals in the area of rehabilitation medicine concerning utilization of different measures and the associated difficulties in comparing these data.

Therefore, we claim that there is a distinct advantage of comprehensive ICF-Core Set because it enables us to assess each and every aspect of disability, health and functioning by virtue of a single, and comprehensive and multi-perspective system prior to the commencement of the rehabilitation program.

In conclusion, our results showed the common problems, complications and special needs in a Turkish population with SCI. Our information will provide a perspective and some guidance to rehabilitation professionals and in developing sound health policies.

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