



## The Effect of Injury-Related Characteristics on Changes in Marital Status after Spinal Cord Injury

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### Abstract

**Background:** Spinal cord injury (SCI) imposes a significant burden on the social and marital life. Here, we assessed the divorce rate and changes in marital status among a sample of Iranian individuals with SCI.

**Methods:** Referred patients to Brain and Spinal Cord Injury Research Center were invited to participate in this cross-sectional investigation. The Main exclusion criteria were coincidental brain injury, history of chronic diseases before SCI and substance use. Demographic characteristics (including age, gender, educational level, marital status before and after injury and duration of marriage) and Injury characteristics (level of the injury, American spinal injury association (ASIA) scale and Spinal cord independence measure III (SCIM)) were collected.

**Results:** Total of 241 subjects with SCI participated in this investigation (164 (68%) male and 77 (32%) female). Among men, 16.5% [95% CI: 10.81%-22.18%] and among women 18.2% [95% CI: 9.58%-26.81%] got divorced after injury. Duration of marriage before injury was significantly related to lower divorce rate ( $P < 0.001$  and 0.016 in men and women, respectively). Injury characteristics had no relationship with marital longevity. Age was a protective factor against marital dissolution only in men ( $P < 0.004$ ).

**Conclusion:** Our study revealed the divorce rate of 17% [95% CI: 13%-20.9%] after SCI in a sample of Iranian population. The protective influence of age in maintenance of marriage was only detected in men, which proposes existence of a sexual polymorphism in the role of age. Divorce rate was similar between two genders and injury characteristics were not related to divorce rate as well.

**Keywords:** Marital status, Spinal cord injury, Divorce, Iran

### Introduction

Spinal cord injury (SCI) has a noticeable effect on medical, social, psychological and economic conditions among affected individuals (1, 2). Higher rate of divorce has been demonstrated after SCI (3) which may affect patients' mental health as well. The association between mental health and marital status has already been described (4, 5). However, while some investigations have de-

scribed the mental health advantages of being married (5) other studies do not support the relationship between marital status and overall well-being (6, 7).

Marriage has a positive impact on health because of greater social support in the context of disability (8). Being married among patients with SCI has been reported to be associated with higher life

satisfaction and quality of life and better adjustment (9, 10). The estimation divorce rate after SCI has been reported to be 1.5–2.5 times higher than that of the general population (11). However the factors that are associated with divorce rate are poorly categorized. Higher divorce rate occurs mostly in the first three years after SCI (12, 13) which illustrates the effect of post injury duration. Other factors such as gender may affect patients' mental health after marital transitions since it has been demonstrated that dissolution of marriage after SCI may be experienced differently by men and women (14). Previous studies have tried to describe the factors that are associated with divorce after SCI. In this regard, demographic characteristics (including younger age at marriage, being female and lower education) and injury characteristics (indicative of more severe injuries) have been shown to be related to higher divorce rate (3). However social and cultural issues and the conditions that divorced couples should go through after divorce vary among different nations and may affect the probability of divorcing. Because of these cultural differences, the changes on marital status after SCI and its related variables should be evaluated in each nation separately. In this study, we tried to assess the changes in marital status among Iranian men and females after SCI. Our purpose was to identify the factors that may affect divorce rate and marital longevity. To our knowledge, this is the first study which investigates changes in marital status and its related factors in a sample of Iranian population with disability.

## Material and Methods

### *Study Design and Participants*

In this cross-sectional study, data were collected from men and women with traumatic SCI referred to Brain and Spinal Cord Injury Research Center (Tehran, Iran) which is tertiary hospital-based rehabilitation center. Total of 241 patients were recruited. Inclusion criteria were traumatic spinal cord injury and age above 18 years old. Exclusion criteria included coincidental brain injury, non-

traumatic SCI, previous history of severe chronic diseases before injury occurrence (cancer, mental disorders, renal failure, liver dysfunction etc.). Those with history of addiction to illegal drugs or alcohol before injury were excluded as well. Procedure of sampling was performed based on patient selection according to inclusion and exclusion criteria. According to previous study (15), the prevalence of SCI is 1.2-11.4 per 10,000 people and by considering the population of Tehran to be 8 million people, the estimated population size of patients with SCI is 970 and the calculated sample size with 5% error will be 275. However, in this investigation, 241 patients could be recruited.

Data were collected by interview from March 2014 to August 2014.

There were some concerns about patients' responsiveness when addressing marital and familial issues. To increase responsiveness, patients were assured about the confidentiality of their information. Informed consent has been obtained from each individual before enrollment. Participation in this investigation was voluntarily. This study was approved by Ethics Committee of Tehran University of Medical Sciences.

### *Demographic characteristics and Marriage features*

Demographic characteristics including age, gender, educational level of the patients and their spouses were collected during interviews with direct questions. Educational level was classified as: illiterate, primary school, high school and collegiate educations. Marital status before and after injury, and duration of marriage were asked and were indexed into pre-prepared forms. Patients were asked to describe if they have got divorce after injury or they are living separately from their spouses without official divorce. Being widow/widower has also been indexed in pre-prepared forms. Injury characteristics including time since injury occurrence were also indexed in these forms.

### *Neurological assessment*

Completeness of injury was classified as either complete (no preserved sensory or motor function) or incomplete (variable motor function pre-

served below the neurological level of injury) (16). Level of injury was assessed with clinical examinations and magnetic resonance imaging (MRI) and was confirmed by expert neurologists. Patients were also classified according to American Spinal Cord Injury Association (ASIA) impairment scale (17) determined based on clinical examination. In this classification, ASIA-A indicates complete injury with no preserved motor or sensory function below the neurological level. ASIA-B describes incomplete injury in which only sensory function is preserved below the neurological level. ASIA-C illustrates preserved motor function in which more than half of key muscles below the neurological level have a muscle grade less than 3. ASIA-D indicates preserved motor function in which at least half of key muscles below the neurological level have a muscle grade of 3 or more and finally ASIA-E represents normal motor and sensory function. Only ASIA-A represents complete injury (18). Excellent intrarater reliability (0.9) and Criterion Validity (0.8) of this measurement tool have been demonstrated (19).

Spinal cord independence measure III (SCIM) was used to evaluate patients' independency and ability in conventional daily activities (20). This instrument consists of three subscales: self-care (0-20), mobility (0-40 scores) and respiration and sphincter management (0-40 scores) which comes to a maximum score of 100. Feeding, bathing, dressing and grooming are evaluated in self-care domain. Respiration, bladder and bowel management along with ability of use toilet are assessed in the domain of respiration and sphincter management. Indoor and outdoor tasks are evaluated in the domain of mobility. Higher scores illustrate more independency (21). This measurement tool has been shown to have an acceptable reliability with Cronbach's alpha above 0.7 and validity with correlation coefficient of 0.9 (22)

### Statistical Analysis

All statistical analysis was performed using SPSS software, Version 18.0 (SPSS Inc., Chicago IL, USA). Categorical data were expressed by percentages and continuous quantitative values were expressed by mean  $\pm$  standard deviation (SD). Pear-

son Chi square test was used to compare categorical data. Comparison of means was performed using one-way analysis of variance (ANOVA). Correlation test was used to identify the relationship between continuous quantitative variables. Confidence interval (CI) of the prevalence of divorce between subgroups as categorical variables (classified based on gender, injury level (cervical, thoracic and lumbar)), ASIA scale (A, B, C, D) and completeness of the injury) was measured using Kay's excel spreadsheet of Confidence Intervals for Proportions. CI in continuous variables was measured using one-sample *t*-test. The factors that may affect marital status are social interactions, income, previous familial problems and having children which were not evaluated in this study and therefore no adjustments for these confounders was exerted. Partial correlation with adjustment for age was performed to assess the effect of duration of marriage on divorce rate.

### Results

Total of 241 subjects with SCI participated in this investigation (164 (68%) male and 77 (32%) female). There was no significant difference in the mean age between two genders ( $P < 0.16$ ). Similarly, educational level was not significantly different between men and women ( $P < 0.58$ ). Times since injury, the level of injury and ASIA scores were also similar between male and female individuals ( $P < 0.77, 0.11$  and  $0.08$ , respectively). Table 1 illustrates the demographic and injury-related characteristics in patients with SCI who participated in this investigation. Completeness of injury was also similar between men and women ( $P < 0.33$ ). Mean SCIM score was  $47.58 \pm 23.78$  in males (95% CI: 43.40-51.76) and  $43.52 \pm 25.32$  in females (95% CI: 37.44-49.61) and showed no significant difference between two genders ( $P < 0.26$ ).

Among men with SCI, 113 (68.9%) subjects were married before injury and 51 (31.1%) were single. After injury 27 patients got divorce and in two patients their spouses reported to be dead. However, three cases of marriage occurred in males patients after injury.

**Table 1:** Baseline and injury characteristics in Iranian participants with spinal cord injury

Category	Male (n: 164)		Female (n: 77)		P-value
	Mean (SD) [95% CI]	Frequency (%) [95% CI]	Mean (SD) [95% CI]	Frequency (%) [95% CI]	
Age (yr)	36.14 (11.33) [34.32-37.96]	-	34.01 (9.8) [31.73-36.29]	-	0.16*
Educational level	Illiterate	-	14 (8.5) [4.23-12.76%]	3 (3.9) [0-8.22%]	0.58#
	Primary School	-	67 (40.9) [33.37-48.42%]	34 (44.2) [32.93-55.06%]	
	High School	-	60 (36.6) [29.22-43.97%]	22 (28.6) [18.50-38.69%]	
	University	-	23 (14) [8.68-19.31]	18 (23.4) [13.94-32.85%]	
Time Since Injury (years)	4.33 (3.48) [3.77-4.88]		4.18 (3.54) [3.34-5.02]		0.77*
Injury Level	Cervical		54 (32.9) [25.70-40.09%]	21 (27.3) [17.34-37.25%]	0.11#
	Thoracic		78 (47.6) [39.9-55.24%]	47 (61) [50.10-71.89%]	
	Lumbar		32 (19.5) [4.52-18.87%]	9 (11.7) [4.25-18.87%]	
Completeness	Complete		81 (49.4) [41.74-57.05%]	35 (45.4) [34.37-56.62%]	0.33#
	Incomplete		83 (50.6) [42.94-58.25%]	42 (54.5) [43.37-65.62%]	
ASIA Score	A		81 (49.4)	35 (45.4)	0.08#
	B		59 (36.0)	30 (39.0)	
	C		20 (12.2)	5 (6.5)	
	D		4 (2.4)	7 (9.1)	
SCIM score	47.58 (23.78) [43.40-51.76]		43.52 (25.32) [37.44-49.61]		0.26*

ASIA: American spinal cord injury association scale, CI: Confidence Interval, SCIM: Spinal cord independence measure III, SD: Standard Deviation

\* P-values stand for One-way Comparison of Variance (ANOVA) for the comparison of means between groups

# P-values stand for Chi-square test to determine differences in categorical data between groups.

All these patients, who had marriage after injury, had incomplete injury with ASIA C and SCIM score higher than 70. Marital status after injury in men was married in 87 (53%) and non-married in 77 (47%) of patients (48 single, 27 divorced and 2 widowers). Divorce rate among Iranian men with SCI was 16.5% (95% CI: 10.81-22.18). Among those men who were married before injury and remained being married after injury, the duration

of marriage before occurrence of accident was  $13.84 \pm 10.29$  years while duration of marriage among those who were divorced after injury was  $5.94 \pm 8.21$  years. Longer marriage duration before injury was significantly related to marriage maintenance ( $P < 0.001$ ). However level of injury and its completeness showed to have no relationship with marriage maintenance ( $P < 0.53$  and  $0.28$ , respectively). Similarly, divorce rate was not associated

with injury level, completeness and ASIA score ( $P < 0.56$ ,  $0.70$  and  $0.12$ , respectively). Older ages was related with higher probability in maintaining marriage ( $P < 0.004$ ). In fact, those men who were older and had a longer duration of marriage be-

fore injury had higher chances to keep their marriage but divorce probability was higher among those with younger age and shorter marriage duration before accident. Table 2 illustrates the factors related with marriage maintenance after SCI.

**Table 2:** Factors associated with marriage maintenance in patients who were married before occurrence of spinal cord injury

Factor	Males (n: 164)	Females (n: 77)
Age (yr)	#0.004**	#0.29
Injury Level	^0.53	^0.07
Completeness of Injury	^0.28	^0.22
ASIA score	^0.05	^0.32
SCIM score	#0.48	#0.57
Educational Level	^0.15	^0.61
Duration of Marriage before injury occurrence	#0.001**	#0.016*
Time Since Injury	#0.64	#0.08

\* Significance at level  $< 0.05$

\*\*Significance at level  $< 0.01$

#  $P$ -values stand for One-way Comparison of Variance (ANOVA) for the comparison of means between groups

^  $P$ -values stand for Chi-square test to determine differences in categorical data between groups.

Among women, 56 (72.7%) subjects were married before injury and 21 (27.3%) were single. After accident 13 patients (16.9%) got divorced, one had marital separation (without official divorce) and five women lost their spouses due to the death of their husbands (6.5%). One case of marriage occurred after injury in a 32 year old woman with post injury duration of 17 years who had incomplete injury at L2 level with ASIA C and SCIM of 74. So, the number of married women after injury reached 38 (49.4%) and the number of non-married females (single, divorced, separated or widowed) reached 39 (50.6%). Divorce rate among Iranian women after SCI was 18.2% (95% CI: 9.58-26.81). Similar with men, higher marriage duration before injury was associated with higher probability of marriage maintenance in women with SCI ( $13.59 \pm 8.4$  years among those who continued being married after injury and  $7.25 \pm 6.98$  among those who had a terminated marriage,  $P < 0.016$ ). Unlike men, age was not a factor affecting the maintenance of marriage in women (Table 2).

## Discussion

The largest proportions of patients before injury were married in our investigation in Iranian population whereas Krause et al. (23) showed larger number of single individuals in the United States. One reason for this difference is that in modern countries like U.S, couples may live together without official marriage but in Islamic countries registered marriage is an obligation. Our study revealed 'age' as a factor positively related with marriage longevity which is in line with Karana-Zebari et al.'s report (24). Higher ages were associated with lower divorce probability in general population (25) and our study illustrated the similar influence of age on marriage longevity. This is maybe because of a better adjustment with environment and a more stable life in older ages. However here we detected this protective effect of age only among males. To our knowledge, our study is the first showing a sexual polymorphism in the role of age in marriage maintenance among patients with SCI. To understand the reasons of more stability of marriages in older ages when male partner is

spinal cord injured requires investigating the cultural issues and familial roles of partners. Further investigation with consideration of social and familial relationships should be performed to clarify this sexual polymorphism.

Higher educational level was associated with lower risk of divorce but we found no relationship between educational level and probability of marriage maintenance in Iranian population with SCI (24). Moreover, similar to previous study (24), our investigation found no influence of injury level, ASIA score and independency (SCIM score) on marriage longevity. The insignificant effect of all these factors may be explained when considering the social concerns that divorced individuals may encounter in Iranian culture. Further investigation with adjustment for these social factors should be performed to clarify the effect of educational level and injury characteristics on marital status after SCI. Divorce rate of general population in Iran in 2013 has been reported to be one in each five marriages (20%) (26). Here, we have shown a divorce rate of 17% among patients with SCI which shows comparable and approximately similar rate between general population and patients with SCI. Karana-Zebari et al. (24) also showed longer duration of pre-injury marriage as a protective factor against marital dissolution which is in consistency with our results.

While DeVivo et al. (12) reported higher divorce rate among those patients with SCI with lower educational level, we could not identify educational level as a protective factor against divorce. When comparing the results on the effect of educational level, it should be considered that a large proportion of Iranian population with SCI are illiterate or only have finished primary school (49.4% in men and 48.1% in women). This significant difference in the percentages of people with low educational level between Iran and modern countries may cause such controversies between our results and previous literatures (12).

DeVivo et al. (12) also showed lower divorce rate among those with low injury level (at lumbosacral injuries) which contradicts with our findings, since we detected no association between injury level and marital longevity. Here, we have concluded

that the negative image of divorce which is imposed through cultural issues has resulted in higher resistance and adjustment in Iranian families. In this study we did not asked the participants about the reasons for their divorce (or similarly for not getting a divorce) and further investigations are required to clarify the social and cultural aspects of this controversy.

In our study, four patients married after injury (three men and one woman). As Crewe and Krause (27) have already described, those patients with SCI who marry after injury are measurably different in several respects from those who remained single. In our study all these four patients had incomplete injury at lumbosacral level (ASIA C) with acceptable independency (SCIM>70). The probability of marriage for those single patients with SCI who have complete injury at higher levels is noticeably low. Those marriages that occur after injury compared with pre-injury marriages have greater satisfaction with their sex lives, living arrangements and social lives even when the severity and the duration of injury were similar (28).

In our study, injury characteristics were not major predictors of divorce. Previous literatures have supported that other factors including lower social interactions and fewer activities (29) may play a major role the success of their marriage rather than injury characteristics. Here, we did not evaluate the level social integration and activities in these patients but our study have similarly illustrated the non-significant role of injury characteristics in after SCI.

One source of bias in our study was existence of some concerns about patients' responsiveness. However, patients were assured about the confidentiality of their information at the time of enrollment to increase patients' responsiveness.

Since our research center is a referral center and patients from all over the country are referred to this center, our sample can present the Iranian population with SCI. The number of participants (241) by considering the prevalence of SCI in Iran is also admissible. The results of our investigation can be further generalized to the Iranian population with SCI. The major practical implication of our study is to identify the major factors that may

affect marital status and to implement supportive strategies in the sensitive groups. Our study showed that younger individuals with shorter marriage duration are more susceptible to marriage dissolution and may require more support.

### Study Limitations

In this cross-sectional study, no follow-up visits were planned and the recorded marital statuses of patients were indexed at the time of interview. Further investigations with long term follow-up are needed to clarify the role of post injury duration on marriage by calculating the divorce rate in each pre-defined time intervals after injury. Cohort studies to compare the incidence of divorce between patients with SCI and general population may enlighten the impact of SCI on changes in marital status.

### Conclusion

This study evaluates the factors affecting marital status after SCI. Our results show that age (only in males) and duration of marriage before occurrence of injury are protective factors against divorce. Divorce rate was rather similar between men (23.8%) and women (23.2%). Injury characteristics including injury level, completeness and patients' independency (SCIM score) were not associated with divorce probability.

### Ethical considerations

Ethical issues (including plagiarism, informed consent, misconduct, data fabrication and/or falsification, double publication and/or submission, redundancy, etc.) have been completely observed by the authors.

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