

Factors That Influence Employment After Spinal Cord Injury in South Korea

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Objective To investigate employment status after spinal cord injury (SCI) and identify personal, family, and injury characteristics those affect their employment in South Korea.

Methods Participants were 334 community-dwelling persons 20–64 years of age who had sustained SCI for more than one year. Investigators visited each participant's home to carry out the survey. Bivariate and binary logistic regression analyses were performed to identify personal, family, and injury characteristics that influenced employment after SCI.

Results Employment rate decreased significantly from 82.5% to 27.5% after SCI. Logistic regression showed that the probability of employment was higher in men than women, and in individuals older than 45 years at the time of injury than those aged 31–45 years of age. Moreover, employment was higher in individuals injured for longer than 20 years than those injured for 1–5 years and in individuals with incomplete tetraplegia than those with complete paraplegia. Employment was lower in individuals with SCI caused by industrial accidents than those injured in non-industrial accidents.

Conclusion Injury characteristics are the most important predictors of employment in persons with SCI. For persons with lower employment rate, individualized vocational rehabilitation and employment-support systems are required.

Keywords Spinal cord injuries, Employment, Persons, Family, Industrial accident

INTRODUCTION

Spinal cord injury (SCI) is one of the most devastat-

ing injuries that can occur. It leads to crucial changes in work, family and daily life of the injured individual. The employment of persons with SCI has received much attention as employment and income crucially affect the lives of these individuals and their families. Labor-force participation is positively associated with life satisfaction in people with SCI [1-3] and with psychological adjustment after injury [4]. In addition, the employment of people with SCI has a positive influence on the adjustment of family and social relationships post-injury because it decreases psychological distress [5,6]. However, individuals with SCI face formidable social barriers to their entry/re-entry into the labor market.

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The number of persons with SCI in South Korea has not yet been determined, and comprehensive statistics on their labor-force participation have not been collected. The '2011 Nationwide Survey of Korean People with Disabilities' did not collect information on the employment of people with SCI; however, the data indicated that 38.5% of people with disabilities were working in the Korean labor market [7]. It is presumed that participation of people with SCI in the labor force was lower than that of the entire population of individuals with disabilities, based on the fact that a relatively high proportion of persons with SCI have severe disabilities.

Employment rates after injury vary depending on the definition of employment and the country. Several studies on the employment of individuals with SCI demonstrated that approximately 30%–40% of these individuals participated in the labor market in Western countries [2,8-10]. These previous studies have identified personal characteristics (e.g., gender, age, and education level) and/or injury characteristics (e.g., age at injury, time since injury, and injury severity) as the main variables that influence labor-force participation. Most of the studies, however, were conducted in North America and Europe. Studies in Asian countries including South Korea are scarce.

The aim of this study was to investigate employment status after SCI and verify how personal, family, and injury characteristics affected their employment in South Korea.

MATERIALS AND METHODS

Participants

This study used the secondary data collected by the 'National Survey of People with Spinal Cord Injury' that was conducted from October 18–27, 2010. The 380 participants who were randomly selected from 12 affiliated national regions were members of the Korean Spinal Cord Injury Association (KSCIA), a non-profit and non-governmental organization. The survey data included the characteristics of respondents' disabilities and details of their health condition, level of physical activity, daily life, everyday food intake, as well as any pre-injury and post-injury employment. Trained surveyors visited participants' homes and interviewed them individually. Eight participants were excluded for omitting information or

containing responses that rendered their testimony unreliable. Respondents who met the following criteria were included: 1) people with SCI aged 20 to 64 years who could participate in the Korean labor market, 2) living in the community, and 3) at least more than 1 year of being injured. At the end, 334 participants were recruited for final analysis.

The method and questionnaire used in this study were reviewed and approved by our institution's research committee for human subjects (IRB No. B-1109/135-010).

Outcome variable

The main outcome variable was the employment of South Koreans with SCI. This variable was calculated on the basis of the question "After injury, are you currently working for more than an hour per week for the purpose of earning, or have you performed unpaid family work for more than 18 hours per week?" This question intended to determine whether the respondents had participated in work [11]. Respondents who worked for more than 1 hour per week for economic purposes or 18 hours per week for unpaid family work were coded as '1' for employed and others were coded as '0' for non-employed.

Predictor variables

Personal, family, and injury variables were the main predictor variables used in this study. Gender, age at survey, education level, and pre-injury employment experience were assessed as personal variables. Specifically, education level was classified into 10 categories, from non-educated to completion of graduate school ('1' for individuals who had never received any formal schooling, '2' for those who graduated elementary school, and so on through to '9' for those who attended graduate school but dropped out and '10' for those who graduated from graduate school.)

Family variables included marital status, number of family members in the household and monthly household income. Marital status was recoded as a dichotomous variable ('0' for married and '1' for other-than-married status) to emphasize the presence of a spouse compared with other family situations. Number of family members in the household was defined as the number of individuals living in the same household. Monthly household income was assessed by the question "What is your household's total monthly income, including

income from salaries and wages, real estate profits, pensions, interest on savings or investments, government subsidies and allowance from relatives or adult children?" to indicate the financial status of respondents.

Injury variables were assessed using questions pertaining to the age at injury, time since injury, type of injury and whether it was caused by an industrial accident. Age at injury and time since injury were measured as continuous variables. These two variables were categorized according to previous study of standardization of data analysis in SCI persons [12]. Age at injury was categorized as '1' for 30 years or younger, '2' for 31–45 years, and '3' for 46 years or older. Time since injury was categorized into five 5-year blocks (1 for 1–5 years, 2 for 6–10 years, 3 for 11–15 years, 4 for 16–20 years, and 5 for 21 years or more).

Missing data

Missing data for most variables represented only a small proportion of the data (under 2.5%). However, data on monthly household income was missing from 28.1% of the respondents. This study used multiple imputation (MI) procedures to deal with missing data, which reduce the associated uncertainty by estimating unbiased parameters and unbiased standard errors.

Data analyses

Data were summarized as frequencies and proportions for dichotomous variables, and as mean±standard deviation for continuous variables. Chi-square (χ^2) test was used to compare categorical data and independent t-test was performed for comparisons of continuous variables. Binary logistic regression was performed to determine the association between the dependent variable 'employment after injury' and each of the several possible independent variables. Significance was set at $p < 0.05$. All statistical analyses, including MI procedures, were performed using the statistical package SPSS ver. 18.0 (IBM, Armonk, NY, USA).

RESULTS

Comparison of the pre-injury and post-injury employment rates revealed that 82.5% of respondents had been employed before being injured, whereas only 27.5% of respondents were presently participating in the labor

market (Table 1).

Table 2 shows the results of analyses between employment and personal and family variables. Among a total of 334 participants, 29.4% of men and 18.2% of women were employed at the time of the survey ($p=0.06$). The mean age at survey was 42.9 ± 9.4 years for employed respondents and 45.1 ± 9.0 years for non-employed respondents ($p=0.05$). The majority (76.2%) of respondents had a high-school level education or lower, and 82.5% had gained some work experience before the injury. Also, education level and pre-injury employment did not show a significant difference.

Of the 332 respondents who supplied marital status data, 55.4% were married ($p=0.22$). The average number of people living in the households of employed respondents was 2.6 ± 1.2 , whereas for non-employed respondents it was 2.9 ± 1.4 . Respondents who were employed were thus likely to live with fewer family members than those who were not employed ($p=0.03$). The average monthly household income of all respondents was 1.8 ± 1.2 million Korean won, with a difference of 0.2 million Korean won between the households of employed and non-employed individuals; however, this difference was not significant (Table 2).

The association between employment and injury characteristics was also investigated (Table 3). The employment rate of respondents with an age at injury under 31 years or over 45 years were 33.1% and 36.0%, respectively, whereas the rate among those aged between 31–45 years was 18.1%, considerably lower than the rates observed in the other groups. The associations between age at injury and employment after SCI were statistically significant ($p=0.009$). There was no significant association between time since injury and employment after injury. Complete paraplegia was the most frequent type of injury (41.0%). Twenty-five (36.8%) of individuals with incomplete tetraplegia reported being employed at survey, while only

Table 1. Descriptive data of pre- and post-injury employment

	Employed	Non-employed	Total
Pre-injury	269 (82.5)	57 (17.5)	326 (100.0)
Post-injury	92 (27.5)	242 (72.5)	334 (100.0)

Values are presented as number (%).

Table 2. Correlation between post-injury employment and personal and family characteristics

Characteristic	No.	Employed	Non-employed	Total	p-value
Gender	334				0.06
Men		82 (29.4)	197 (70.6)	279 (83.6)	
Women		10 (18.2)	45 (81.8)	55 (16.4)	
Age at survey (yr)	334	42.9±9.4	45.1±9.0	44.5±9.2	0.05
Education	332				0.26
Non-high school graduates		18 (21.4)	66 (78.6)	84 (25.3)	
High school graduates		47 (27.8)	122 (72.2)	169 (50.9)	
Bachelor's degree graduates and higher		26 (32.9)	53 (67.1)	79 (23.8)	
Pre-injury employment	326				0.40
Yes		73 (27.1)	196 (72.9)	269 (82.5)	
No		17 (29.8)	40 (70.2)	57 (17.5)	
Marital status	332				0.22
Married		46 (25.0)	138 (75.0)	184 (55.4)	
Other		46 (31.1)	102 (68.9)	148 (44.6)	
Family members	328	2.6±1.2	2.9±1.4	2.9±1.3	0.03 ^{a)}
Monthly income (million Korean won)	240	1.7±1.2	1.9±1.3	1.8±1.2	0.16

Values are presented as number (%).

^{a)}p<0.05.

Table 3. Correlation between post-injury employment and injury characteristics

Characteristic	No.	Employed	Non-employed	Total	p-value
Age at injury (yr)	333				0.009 ^{a)}
<31		60 (33.1)	121 (66.9)	181 (54.4)	
31-45		23 (18.1)	104 (81.9)	127 (38.1)	
>45		9 (36.0)	16 (64.0)	25 (7.5)	
Time since injury (yr)	334				0.64
1-5		13 (24.1)	41 (75.9)	54 (16.2)	
6-10		24 (29.6)	57 (70.4)	81 (24.3)	
11-15		14 (21.9)	50 (78.1)	64 (19.2)	
16-20		22 (28.2)	56 (71.8)	78 (23.4)	
21+		19 (33.3)	38 (66.7)	57 (17.1)	
Type of injury	327				0.09
Complete paraplegia		12 (18.8)	52 (81.3)	64 (19.8)	
Incomplete paraplegia		19 (31.7)	41 (68.3)	60 (18.2)	
Complete tetraplegia		33 (24.4)	102 (75.6)	135 (41.0)	
Incomplete tetraplegia		25 (36.8)	43 (63.2)	68 (21.0)	
Industrial accident	334				<0.001 ^{a)}
Yes		14 (13.5)	90 (86.5)	104 (31.1)	
No		78 (33.9)	152 (66.1)	230 (68.9)	

Values are presented as number (%).

^{a)}p<0.05.

Table 4. Binary logistic regression of personal, family and injury characteristics on employment after spinal cord injury (n=334)

Variable	OR	95% CI	p-value
Gender (men=1)	0.38	0.17–0.86	0.02 ^{a)}
Age at survey	0.96	0.91–1.01	0.10
Education	1.19	0.99–1.44	0.06
Pre-injury employment	0.61	0.29–1.31	0.21
Marital status	1.05	0.55–2.01	0.89
Family members	0.83	0.64–1.06	0.13
Monthly income	1.00	1.00–1.01	0.27
Age at injury (ref. >45 yr), (yr)			
<31	0.27	0.06–1.15	0.08
31–45	0.30	0.10–0.88	0.03 ^{a)}
Time since injury (ref. >20 yr), (yr)			
1–5	0.23	0.06–0.99	0.05 ^{a,b)}
6–10	0.40	0.12–1.30	0.13
11–15	0.34	0.11–1.08	0.07
16–20	0.46	0.18–1.17	0.10
Type of injury (ref. incomplete tetraplegia)			
Complete paraplegia	0.36	0.15–0.88	0.03 ^{a)}
Incomplete paraplegia	0.84	0.37–1.92	0.68
Complete tetraplegia	0.73	0.35–1.51	0.40
Industrial accident (yes=1)	4.31	1.92–9.65	<0.001 ^{a)}

OR, odds ratio; CI, confidence interval.

^{a)}p<0.05. ^{b)}The p-value of ‘time since injury’ was rounded to 0.05 from 0.048.

18.8% of individuals with complete paraplegia were employed. However, work participation regarding type of injury was statistically insignificant.

Injury caused by an industrial accident was reported by 31.1% of respondents. The work participation rate among respondents who had suffered industrial accidents was 13.5%, and the employment rate among individuals who suffered non-industrial accidents was 33.9%. The association between work participation and whether the SCI was caused by an industrial accident was highly statistically significant (p<0.001).

Table 4 shows the results of the binary logistic analysis of factors that influenced the employment of people with SCI. The odds for being currently employed were 61.6% higher among men with SCI (odds ratio [OR], 0.38; 95% confidence interval [CI], 0.17–0.86). Compared with those who were injured at an age between 31 and 45 years, those who were injured at an age over 45 years had 70.5% greater odds of participating in the labor market (OR, 0.30; 95% CI, 0.10–0.88). The odds of employment

for respondents injured more than 20 years were 76.6% higher than those for individuals injured 1–5 years (OR, 0.23; 95% CI, 0.06–0.99). Regarding the type of injury, the odds of employment for the respondents with incomplete tetraplegia were 63.8% higher than those for the respondents with complete paraplegia (OR, 0.36; 95% CI, 0.15–0.88). The odds of employment for persons with SCI caused by non-industrial accidents were 330.9% higher than those for individuals with SCI caused by industrial accidents (OR, 4.31; 95% CI, 1.92–9.65).

DISCUSSION

In this study, the proportion of people participating in the labor force was significantly decreased after SCI. In addition, the employment rate of the South Korean SCI population was lower than those of previous studies [2,8–10,13–16]. Five variables were significantly associated with the employment status of people of SCI: gender, age at injury, time since injury, type of injury, and whether

the injury was caused by an industrial accident. Employment after injury was higher 1) in men than in women, 2) in individuals injured at an age over 45 years than in those injured between 31 and 45 years of age, 3) in individuals injured for longer than 20 years than in those injured for 1–5 years, 4) in people with incomplete tetraplegia than in those with complete paraplegia, and 5) in people with SCI caused by non-industrial accidents than in those injured in industrial accidents.

The employment rate after injury was higher in men than women. This is consistent with previous studies reporting an association between gender and employment in individuals with SCI [2,13,14,17].

Previous studies reported a negative association between age at injury and employment after injury [2,18]. However, the employment rate of individuals injured between 31 and 45 years of age was the lowest among all groups in this study. Middle age is the period when people learn social and vocational knowledge and skills. However, most people with SCI who sustained the initial injury between 31 and 45 years of age experienced a career discontinuity without acquiring enough of these knowledge and skills. This may result in relatively higher psychological pressure and a longer process of vocational training and job-seeking compared with other age groups.

In our study, respondents who had been injured for 1–5 years were less likely to be employed than those who had been injured for more than 20 years. This result is consistent with previous studies. Krause et al. [19] suggested that the employment rate of people with SCI reaches its peak for individuals who have been injured for more than 20 years. Moreover, most previous research has consistently shown that post-injury employment gradually increases from 5 years post-injury onwards [17,20]. Other studies showed had approximately 5 years from the time of SCI onset to their first post-injury employment [16,21]. In both studies, those who returned to their pre-injury job showed shorter duration between SCI onset and post-injury employment. The slow return to employment was generally associated with needs for further re-education and training. Thus, employment rate might be lower within 5 years since SCI, because some SCI individuals need time to adapt to their injury before searching for and obtaining a job.

Regarding the relationship between injury type and

post-injury employment, the difference in employment between people with complete paraplegia and people with incomplete tetraplegia was significant; however, there was no difference in the other groups. Previous studies showed that a lesser degree of injury leads to better employment prospects [18] and that the employment rate of people with incomplete paraplegia is higher than that of people with complete paraplegia [2,22]. In this study, however, although the employment rate was lower among individuals complete paralysis compared with the rest (incomplete paraplegia and incomplete tetraplegia); only complete paraplegia and incomplete tetraplegia showed significant difference.

In this study, the most important factor for predicting post-injury employment among people with SCI was whether the SCI was caused by an industrial accident. Consistent with previous studies [22,23], this study revealed that regardless of personal, family or other injury characteristics, many individuals who received compensation for SCI from industrial accidents did not participate in an economic activity. The Korean Industrial Accident Compensation Insurance Act classifies levels of disability into 14 grades and stipulates that 40%–90% of an injured person's average income before disablement must be paid as a pension over their remaining lifespan when a work-place accident causes a level of disability of grade 7 or higher. Additional analysis of the data showed that monthly household income of people with SCI caused by industrial accidents is 1.0 million Korean won higher than that of people with SCI caused by non-industrial accidents ($p < 0.001$). In other words, it appears that the financial stability of households that receive partial compensation for the work-place accident weakens the motivation to seek employment.

Interestingly, education level and pre-injury employment did not significantly influence the employment status of persons with SCI. These results were different from those of previous researches. Education level was the most influential factor regarding employment or return-to-work status of persons with SCI [13,14,18,24]. This is based on the fact that people with higher education have more options for employment [25]. In addition, previous studies found that positions with high employability for persons with SCI were professional or administrative jobs, which require a high education level as opposed to jobs based on manual labor that require minimal formal

education but are physically demanding [15,16]. Furthermore, pre-injury employment was significantly associated with post-injury labor-force participation in persons with SCI [19,22].

However, this study showed that compared to Western countries the employment of South Koreans with SCI might depend less on variables like education level and work experience. Due to the lower post-injury employment compared to previous studies, it could be assumed that persons with SCI had difficulty finding a job regardless of their education level and pre-injury employment in South Korea. Furthermore, additional analysis showed that proportion of workers in such sectors as construction or production was 61.6% and 76.2% had high school diplomas or lower education level. High proportion of manual jobs experience and lower education level of the study population could also have had an effect in the significance of these factors.

There are several limitations of this study. First, the participants were members of KSCIA. This recruitment approach may have introduced selection bias and could limit the generalizability of the study findings. Second, although personality characteristics [17,20], social support [26] and employment-assistance programs, such as vocational training or counselling [27,28], influence employment of people with SCI, these factors were not explored in this research. A different approach to predicting the employment of people with SCI seems to be necessary in future research. Third, this study only focused on the employment rate of people with SCI. Follow-up studies should include an in-depth investigation of the nature of post-injury employment itself, such as whether injured people return to their previous job, the type and quality of their employment and their employment stability. Lastly, this research was carried out based on cross-sectional data, by measuring labor-force participation at the time of this survey. We did not analyse factors, such as job changes, work retention, and entry/exit from the labor market. A time-series analysis needs to be implemented in future research, by accumulating longitudinal data related to labor-force participation.

This study also has several strengths. The data were well organized and collected from a nationally conducted survey of persons with SCI, which had not previously been carried out in South Korea. In addition, we obtained some unique results that were different from previous

studies and which expanding knowledge concerning the employment of people with SCI. These findings can be helpful in building vocational rehabilitation programs that are suitable for persons with SCI in South Korea.

This study shows that the post-injury employment rate of South Koreans with SCI is significantly lower than those of SCI people in Western countries. Individualized vocational rehabilitation and employment-support systems, such as specialized job placement assistance, are required for people who are in the initial phase of the injury or who are middle-aged, as these are the most disadvantaged age groups in terms of labor-force participation after SCI. In addition, programs targeting women and people with severe type of SCI are also necessary. Most importantly, opportunities for occupational achievement and a social support system for reintegration to the work-force have to be guaranteed for individuals with SCI, regardless of their personal, family, and injury characteristics.

In conclusion, the employment rate of South Korean people with SCI was 27.5%, which was lower than the rates measured in previous studies (30%–70%) [2,8-10,13-16]. Furthermore, variables related to human capital, such as education level and pre-injury work experience, were irrelevant to post-injury employment among South Koreans, as were many household variables, such as marital status, number of family members, and household income. By contrast, injury characteristics appeared to be a particularly crucial barrier to the participation of people with SCI in the labor market. The significant impact of injury characteristics on post-injury employment suggests that individualized vocational rehabilitation program and employment-support social services are needed especially for disadvantaged populations.

CONFLICT OF INTEREST

No potential conflict of interest relevant to this article was reported.

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