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ORIGINAL ARTICLE

Determinants of resilience among people who sustained spinal cord injury from the 2015 earthquake in Nepal

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Study design: Cross-sectional study.
Objectives: To assess the level of resilience, compare resilience by demographic and injury-related characteristics, and identify significant determinants of resilience in Nepalese people who sustained spinal cord injury (SCI) from the 2015 earthquake.
Setting: Spinal Injury Rehabilitation Center, Kavre and 14 communities in Nepal.
Methods: Eighty-two participants were included using a convenience sampling technique. A demographic and injury-related questionnaire was used to identify the characteristics of the participants. The Connor-Davidson Resilience Scale was used to measure resilience. Linear regression analysis was performed to determine the demographic and injury-related factors that contribute to resilience.
Results: Almost 54% of the participants had low level of resilience. Independent samples *t*-tests and ANOVA showed that participants with higher resilience outcome were more likely to be male, employed, paraplegic level of injury and pain free. The regression analysis revealed that only gender was a unique determinant of resilience ($\beta = 0.38$, $t = 3.40$, $P = 0.001$) in Nepalese with earthquake-related SCI.
Conclusion: More than half of Nepalese who sustained SCI from the 2015 earthquake in Nepal had not achieved a high level of resilience 2 years later. Gender was a significant determinant of resilience. The results highlighted the importance of providing appropriate intervention and allocating continuing support to the Nepalese people with SCI. A further longitudinal study is recommended to determine predictive factors of the dynamic nature of resilience.
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INTRODUCTION

A major earthquake of 7.8 magnitude struck Nepal on 25 April 2015, followed by a huge aftershock of 7.3 magnitude on 12 May 2015. As a consequence, 8702 people died and ~22 500 people were injured.[1] Among those, spinal cord injury (SCI) was one of the devastating injuries that occurred in more than 173 survivors of the earthquake.[2]

SCI is a chronic condition which results in long-lasting impacts on physical and psychosocial aspects of an individual's life. SCI causes paralysis and complete or incomplete functional impairment below the level of the lesion. Furthermore, individuals with SCI often experience secondary complications related to SCI, which include chronic pain, pressure ulcer, spasticity, urinary tract infection and deep vein thrombosis.[3] Anxiety and depressive symptoms are frequently associated with individuals with SCI, which further impacts physical health.[4,5]

The literature shows that not all individuals with SCI develop depressive symptoms or psychological problems. Some survivors with SCI adjust or cope with the consequences of their injury and achieve a good quality of life.[4,5] Resilience is considered as an important attribute that helps individuals to cope and adjust to the consequences of traumatic events such as SCI or an earthquake.[6,7] Connor and Davidson defined resilience as personal qualities that help a person to adapt in the face of adversity.[8] A previous study demonstrated that 68% of individuals with SCI have an acceptable level of resilience that protects them from developing negative psychosocial consequences.[4] Higher resilience is consistently associated with strong self-efficacy, greater perceived social support and stable mood.[4,5,9]

Resilience can vary among individuals based on the presence of different factors.[10,11] Personal demographic and injury-related factors were found to be associated with resilience among individuals with SCI[12,13] and survivors of earthquake.[14,15] Older age was associated with higher resilience among individuals with SCI[12] and survivors of earthquake.[15] Similarly, resilience varied among the employed and unemployed individuals following SCI[13] and earthquake.[14] It has been found that male survivors tended to have higher resilience than female earthquake survivors.[15] However, resilience did not vary by gender among the individuals with SCI.[4,5] Chronic pain was shown to be associated with lower resilience among individuals with SCI.[12,13] Nevertheless, some studies reported a non-significant association between resilience and demographic and injury-related factors.[4,5,9,12,16] Hence, there are inconclusive findings on the demographic and injury-related variables contributing to resilience. Resilience is dynamic in nature; therefore, a cross-sectional study might not represent a holistic picture. A cross-sectional design in conjunction with a variety of cultures in different research settings could contribute to inconclusive results among different studies.

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The context of adversity/stressor and culture also influence resilience since it impacts on how an individual utilizes family, community and healthcare resources to deal with adversity.[11] Culture and context influence people's beliefs and perceptions of a situation or crisis, sense of self-worth, value of social resources, spiritual beliefs and the way they behave or respond to the situation.[17] From this, resilience can vary according to the type of adversity and cultural context. Several studies have been conducted to determine resilience among individuals with SCI[4,5,12] and survivors of earthquake.[14,15] However, there is a paucity of studies examining the resilience among people who sustained SCI from an earthquake. Previous studies on resilience were conducted mostly among individuals with SCI in developed/western countries, whereas Nepal is different in terms of cultural context, geography and availability of the healthcare system. Nepal consists of a diverse culture with a collectivist society and accessibility to healthcare resources is challenging in some parts of the country. This study was therefore conducted to (1) identify the level of resilience among people who sustained SCI from the 2015 earthquake in Nepal, (2) compare differences in resilience by demographic and injury-related characteristics and (3) identify determinants of resilience among those individuals.

METHODS

Participants

The participants included Nepalese who sustained SCI from the 2015 earthquake. Inclusion criteria consisted of the following: (1) adults who were aged 18 years or older; (2) admitted for rehabilitation or management of complications at the Spinal Injury Rehabilitation Center (SIRC) in Kavre, Nepal; (3) living in the community after discharge from the SIRC; (4) able to understand and speak the Nepali language; (5) fully conscious; and (6) absence of mental problems or cognitive impairments (based on information obtained from SIRC records). Eighty-two participants who met the inclusion criteria and agreed to participate were recruited from 14 communities (districts) and the SIRC. Other potential participants could not be approached because of infrastructure and communication problems that included no mailing address, no phone number or the phone number had changed.

Measures

Based on evidence from previous relevant studies,[12–15] a demographic and injury-related questionnaire was developed to determine the characteristics of the participants. These included age, gender, marital status, educational status, employment status, level of injury, completeness of injury, presence of comorbidities and presence of secondary complications related to SCI. Data related to the level and completeness of injury were retrieved from medical records from the SIRC. Data related to the current comorbidities and secondary complications were derived from the verbal reports of the participants and their medical reports either at their home or at the SIRC. Pain intensity was measured using a Numerical Rating Scale (NRS-11) that ranged from 0 to 10 and was categorized as no pain (0), mild (1–3), moderate (4–6) and severe (7–10) pain.[18]

The Connor-Davidson Resilience Scale (CD-RISC) was used to measure the level of resilience. The CD-RISC is considered to be an appropriate tool to measure resilience among individuals with SCI and survivors of earthquake since it has established appropriate validity and reliability in previous studies.[7,14,15] The CD-RISC consists of 25 items scored on a 5-point Likert scale, which ranges from 0 (not true at all) to 4 (true nearly all the time). The total possible score ranges from 0 to 100, where a higher score indicates greater resilience.[8] The CD-RISC was translated into the Nepali language using the back translation process proposed by Brislin.[19] In this study, Cronbach's alpha of the Nepali version of the CD-RISC was 0.82.

Procedures

A cross-sectional study using self-report questionnaires was conducted among 82 Nepalese with earthquake-related SCI. Data collection was conducted between December 2016 and February 2017.

The name lists and details of participants were identified from the medical records of patients with earthquake-related SCI admitted for rehabilitation at the SIRC. A total of 117 patients who sustained SCI from the 2015 earthquake were admitted in the SIRC.[20] Among those, 101 had contact details. Six and 76 participants were recruited from the SIRC and community settings, respectively. The participants in the communities were recruited via cell phone. The participants who met the inclusion criteria and gave verbal consent were approached at a mutually convenient place and available time. The questionnaires were administered to those who were literate and able to write. The researcher read and filled out the questionnaires for 36 participants who were not able to read and/or write.

Data analysis

Descriptive statistics were used to analyze the tendency and frequency statistics for demographic and injury-related variables. Independent samples *t*-tests and ANOVA were used to identify the differences of resilience among each demographic and injury-related variable. Univariate and multivariate linear regression analyses were performed to determine how much each demographic and injury-related variable uniquely contributed to resilience. Significant determinants from the univariate analysis were entered simultaneously into the multivariate regression analysis. Independent variables, except age and pain, were transformed as dummy variables with codes 1 (male, married, secondary or higher education, employed, paraplegia, incomplete injury, presence of comorbidities) and 0 (single or widowed/separated, illiterate or primary education, unemployed or students, tetraplegia, complete injury, absence of comorbidities). The data met the assumptions of normality, linearity, homoscedasticity, and multicollinearity. The level of significance was set at $P<0.05$. Statistical analyses were performed using the statistical package for social sciences (SPSS; Version 16.0. Chicago, IL, USA).

Statement of ethics

The study proposal was approved by the Institutional Review Board of the Faculty of Nursing, Prince of Songkla University, Thailand, the Nepal Health Research Council and the ethical review committee of SIRC. Ethical principles in conducting research were employed in every step of the study. Written consent was obtained from each participant. All applicable institutional and governmental regulations concerning the ethical use of human volunteers were strictly followed throughout the study.

RESULTS

Participant characteristics

Demographic and injury-related characteristics of the participants are presented in Table 1. The majority of participants were male ($n=48$; 58.5%), married ($n=50$; 61%) illiterate or completed primary level education ($n=42$; 51.2%) and unemployed or students ($n=61$; 74.39%). Seventy-eight participants had paraplegia (95.1%) and 53 had incomplete injuries (64%). Comorbidities that were reported by 19.5% ($n=16$) of the participants included hypertension ($n=7$), gastro-intestinal problems ($n=5$), diabetes mellitus ($n=2$), asthma ($n=1$) and gout ($n=1$). The majority of participants reported secondary complications related to SCI (89%) that included pain ($n=66$), spasticity ($n=21$), pressure ulcer ($n=10$) and urinary tract infection ($n=8$). Severe pain was experienced by 26.8% ($n=22$) of the participants.

Level of resilience

Table 2 displays the descriptive statistics for resilience. The scores of the CD-RISC were categorized into two levels based on a mean resilience score of a study conducted among Indian sample.[21] A CD-RISC score $\leqslant 65$ was interpreted as low resilience and a score >65 was

Table 1 Demographic and injury-related characteristics of participants ($N=82$)

Variables	n	%	*Mean (s.d.) range*
Age (years)			34.80 (11.38)
18–30	32	39.0	(18–64)
31–45	35	42.7	
46–60	14	17.1	
60+	1	1.2	
Gender			
Female	34	41.5	
Male	48	58.5	
Marital status			
Single or widowed/separated	32	39.0	
Married	50	61.0	
Educational status			
Illiterate or primary	42	51.2	
Secondary or higher	40	48.8	
Employment status			
Unemployed or student	61	74.4	
Employed	21	25.6	
Level of injury			
Tetraplegia	4	4.9	
Paraplegia	78	95.1	
Completeness of injury			
Complete	29	35.4	
Incomplete	53	64.6	
Presence of comorbidities			
No	66	80.5	
Yes	16	19.5	
Pain			4.68 (2.81)
No	16	19.5	(0–10)
Mild	6	7.3	
Moderate	38	46.3	
Severe	22	26.8	

Table 2 Descriptive statistics and level of resilience ($N=82$)

Variable	*Mean (s.d.)*	*Score range*	n	%
Resilience (CD-RISC)	64.76 (14.02)	33–95		
Low (⩽65)			44	53.7
High (>65)			38	46.3

Abbreviation: CD-RISC, Connor-Davidson Resilience Scale.

interpreted as high resilience. In this study, overall mean resilience score of the participants was 64.76 (s.d. = 14.02). Forty-four (53.7%) participants presented with low resilience and 46.3% had high resilience.

The univariate analysis of resilience in each demographic and injury-related characteristic of participants revealed that the male and employed participants had a significantly higher resilience score than those of female ($t(80)=-4.80$, $P<0.001$) and unemployed participants ($t(80)=-2.45$, $P<0.05$) (Table 3). Similarly, participants with paraplegia reported significantly higher resilience score than participants with tetraplegia ($t(80)=-3.93$, $P<0.01$). A *post hoc* analysis revealed that participants with severe pain reported significantly lower resilience score than those who did not experience pain ($F_{3,78}=3.19$, $P<0.05$). There was no significant difference in resilience score among other demographic and injury-related variables ($P>0.05$).

In the regression analysis, gender, employment status and pain accounted for 23% variance on resilience (adjusted $R^2=.23$, $F_{3,78}=8.94$, $P<0.001$) (Table 4). Only gender significantly contributed to resilience ($\beta=0.38$, $t=3.40$, $P=0.001$). In other words, male participants had significantly higher resilience than the female participants. Other demographic and injury-related variables did not significantly contribute to resilience ($P>0.05$).

DISCUSSION

The purpose of this study was to extend the knowledge on level of resilience and demographic and injury-related factors contributing to resilience in individuals with earthquake-related SCI. Currently, there is no published evidence that examined resilience in individuals who sustained earthquake-related SCI. Resilience was examined in either individuals with SCI or survivors of an earthquake. Higher resilience was reported among those participants living in other contexts than the participants of this study. A study conducted among individuals with SCI in Australia revealed mean resilience score of 75.3 and 72.9 at discharge and 6 months after discharge, respectively.[4] Additionally, survivors of Haiti earthquake demonstrated mean resilience score of 66.5.[16]

Since the cultural context influences individual beliefs, interpretation of an event, utilization of coping resources and their responses to the event,[17] the differences in the level of resilience could be resulted. This study examined resilience in participants who sustained SCI from an earthquake; therefore, the double effects of both SCI and earthquake could be noticed. Moreover, Nepal is a developing country that has infrastructure constraints as well as inaccessibility to a limited number of healthcare services or rehabilitation centers. These factors along with the geographical nature and culture of Nepal could have affected the level of resilience.

The participants in this study had to face a duality of traumatic events.[2] Generally, an earthquake causes loss of human life, infrastructure and personal belongings and has profound negative physical and psychosocial impacts on the survivors.[22,23] Furthermore, SCI is a chronic condition that also negatively influences the physical, psychological and social aspects of an individual's life. Depending on the extent of injury, individuals with SCI may have varying degrees of muscle paralysis and loss of sensation, which can further result in various secondary complications.[24,25] The participants of this study were confronted with both of these adversities simultaneously; therefore, they tended to experience the negative consequences of both events.

Nepalese are still experiencing a number of aftershocks following the 2015 earthquake. Additionally, different social media frequently report that another huge earthquake might occur in Nepal since the last earthquake did not release all of the seismic energy.[26] Therefore, the Nepalese people, including the participants, are still living with the fear and anxiety related to the aftershocks and the speculation of another major earthquake.[27] Consequently, low resilience of the study participants possibly is related to the stress and anxiety as shown in the literature.[5,6]

Table 3 Univariate analysis of resilience by demographic and injury-related characteristics of participants (*N* = 82)

Variables	*Mean (s.d.)*	*Mean differences*	P-*value*	*95% CI*
Age				
18–30 years	66.09 (14.59)		0.69	(–7.12, 9.42)
31–45 years	64.94 (13.19)	1.15		(–6.88, 14.78)
46–60 years	62.14 (15.44)	3.95		
60+ years	52.00			
Gender				
Female	56.91 (11.96)		**0.000**	
Male	70.31 (12.75)	13.10		(7.85, 18.95)
Marital status				
Single or widowed/separated	64.65 (13.33)		0.96	
Married	64.82 (14.58)	–0.16		(–6.52, 6.16)
Educational status				
Illiterate or primary	62.02 (14.08)		0.07	
Secondary or higher	67.63 (13.56)	–5.60		(–11.68,.48)
Employment status				
Unemployed, students	62.59 (14.00)		**0.016**	
Employed	71.04 (12.36)	–8.46		(–15.31, –1.60)
Level of injury				
Tetraplegia	53.25 (5.25)		**0.009**[a]	
Paraplegia	65.34 (14.09)	–12.09		(–19.75, –4.44)
Completeness of injury				
Complete	66.41 (14.04)		0.43	
Incomplete	63.84 (14.06)	2.56		(–3.90, 9.02)
Presence of comorbidities				
No	65.48 (14.04)		0.34	(–4.05, 11.51)
Yes	61.75 (14.01)	3.73		
Pain				
No	69.44 (11.16)		**0.028**[b]	
Mild	71.33 (15.88)	–1.90		(–18.85, 15.06)
Moderate	65.81 (14.59)	3.62		(–6.93, 14.17)
Severe	57.73 (12.33)	11.71		(0.72, 23.34)

Abbreviation: CI, confidence interval.
Significant *P*-values are written in bold.
[a]Equality of variance not assumed.
[b]A *post hoc* analysis showed significant differences between no pain and severe pain.

Presently, there are a total of five rehabilitation services available in Nepal and most of them are located in the urban areas. Road transportation is the mode of travel to rehabilitation services. The landscape of rural Nepal includes steep mountains and hills where paved roads and public transportation are nearly nonexistent. Therefore, the rural Nepalese with SCI spend more than an hour and up to 4 h to catch a bus.[28] Importantly, there is still a lack of disabled-friendly facilities. Therefore, low follow-up in a rehabilitation program by Nepalese with SCI is common. Consequently, they are more prone to develop secondary complications. As mentioned earlier, 89% of participants experienced secondary complications related to SCI. Poor physical health was found to be related to low self-efficacy and depressive mood among individuals with SCI,[29] which in turn affected resilience.

In the Nepalese cultural context, particularly in the rural areas, disabilities are viewed as 'karma' or punishment from God for the misdeeds in a previous life. Those persons with disability are ignored and treated differently since they are perceived as incapable or imperfect in taking on responsibilities. Disability is seen as a social stigma. Hence, persons with disability are more likely to lose their self-esteem or self-efficacy in the community,[30] which could result in low resilience.[4,5]

Most of the participants in this study were unemployed. In consistent with previous studies the participants who were unemployed reported low mean resilience.[13,14] Engagement in social activities and productive work decreases dependency and enhances self-esteem and satisfaction with life, which was suggested to be associated with high resilience.[13] Thus, the low resilience among

Table 4 Linear regression analyses of demographic and injury-related factors contributing to resilience ($N = 82$)

Variables	*Univariate analysis*			*Multivariate analysis*		
	β	P-*value*	95% *CI*	β	P-*value*	95% *CI*
Age	−0.15	0.18	(−0.46, 0.09)			
Gender[a]	0.47	**0.00**	(7.86, 18.95)	0.38	**0.001**	(4.45, 16.95)
Marital status[a]	0.006	0.96	(−6.16, 6.52)			
Educational status[a]	0.20	0.07	(−0.48, 11.68)			
Employment status[a]	0.27	**0.02**	(1.60, 15.31)	0.10	0.30	(−3.21, 10.02)
Level of injury[a]	0.19	0.09	(−2.05, 26.24)			
Completeness of injury[a]	0.09	0.43	(−9.03, 3.89)			
Presence of co-morbidities[a]	−0.10	0.34	(11.52, 4.05)			
Pain	−0.33	**0.002**	(−2.69, −0.59)	−0.15	0.18	(−1.81, 0.34)

Abbreviation: CI, confidence interval.
Significant *P*-values are written in bold.
Multivariate regression analysis, $R^2 = 0.26$, adjusted $R^2 = 0.23$, $F_{3,78} = 8.94$, $P < 0.001$.
[a]Dummy coded variables.

the participants of this study could be related to several contextual factors.

Furthermore, the majority of participants (80.5%) experienced pain, similar to previous research.[13,31] Individuals with SCI often experience pain that results from nerve damage following injury, overuse of muscles during transfer to and from wheelchairs and medical conditions (for example, constipation, peptic ulcer or nephrolithiasis).[3] Consistent with a previous study,[13] low resilience was evidenced in participants with severe pain.

Previous studies reported no significant difference of resilience in individuals with paraplegia and tetraplegia.[4,9] However, this study revealed a significant difference of resilience between these two groups of participants. Generally, individuals with paraplegia are less dependent and can perform more partial or full self-care activities than those with tetraplegia.[3] Perceived independence in activities and low restriction of mobility were associated with a satisfaction of life and wellbeing among individuals with SCI, which could result in higher resilience.[29] However, that finding should be interpreted cautiously since there was a large disparity in the number of participants with paraplegia and tetraplegia in this study.

In the regression analysis, only gender emerged as a significant determinant of resilience. This finding is incongruent with previous studies, which reported no gender-based difference of resilience among individuals with SCI.[4,5] This can be argued in terms of the cultural context of the gender roles in Nepalese society. In the Nepalese patriarchal society, females are considered as subordinates or inferior to males. Also, they are confined to household chores and they rely psychologically and financially on their husbands or other family members.[30,32,33] On the other hand, males are considered as the leaders of the family and hold major positions in society. Moreover, males are expected to be strong and given higher importance even if they are illiterate or disabled.[33]

Hence, because of the superior position and authority in society, males with disability are more likely to get appropriate care and adequate support from their family and social network. This, in turn, can help to enhance their sense of self-worth or self-esteem. The literature suggested that individuals with SCI who had higher self-esteem were found to have positive adjustment and satisfaction with life, which could be interpreted as high resilience.[29] It was also evident that Nepalese males have higher literacy and employment rates than the females,[28] which may have contributed to higher resilience among the male participants.

Although this study adds evidence to the resilience literature, some limitations and recommendations could be identified. Since this study used the non-probability sampling technique, persons with SCI from each remote area and other rehabilitation centers could not be included into the study. Therefore, the study results might not represent the whole picture of resilience among Nepalese with SCI. Future studies including a wider range of participants are indicated. Furthermore, this cross-sectional study was conducted ~2 years after the 2015 earthquake; a longitudinal study to explore the determinants of resilience including psychosocial determinants is needed. Since resilience can differ by cultural context or country, psychometric testing of the CD-RISC is warranted to determine the sensitivity and feasibility of this tool in the Nepalese context.

In conclusion, this study sheds light on the knowledge regarding resilience among individuals with earthquake-related SCI in Nepal. The findings highlight that the resilience status of more than half of Nepalese individuals with SCI was low and influenced by several factors. Therefore, consideration should be given to develop intervention programs to boost up the resilience of persons in this group. Moreover, those significant factors should be taken into account while developing and implementing the interventions.

DATA ARCHIVING

There were no data to deposit.

CONFLICT OF INTEREST

The authors declare no conflict of interest.

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