Geriatric Nursing 42 (2021) 1264–1274

Contents lists available at ScienceDirect

Geriatric Nursing

journal homepage: www.gnjournal.com

Resilience and its associated factors among older disaster survivors

Rekha Timalsina, PhD Candidate, Praneed Songwathana, RN, PhD*[,1], Wipa Sae-Sia, RN, PhD

Faculty of Nursing, Prince of Songkla University, Thailand

ARTICLE INFO

Article history:
Received 10 February 2021
Received in revised form 8 August 2021
Accepted 9 August 2021
Available online 21 September 2021

Keywords:
Associating factors
Resilience
Older disaster survivors

ABSTRACT

Resilience is a valuable resource in attaining a productive life as well as successful and healthy aging. Little is known about how older people who have experienced the impacts of disasters have fared, especially after earthquakes, in the long term. This cross-sectional analytical study aimed to identify resilience and its associated factors among 324 older disaster survivors. Accordingly, participants reported having an intermediate level of resilience (48.5%), followed by low (28.7%) and high (22.8%) levels. Age, marital status, literacy status, current regular personal income, current health problem, frequent visits to health care centers, perceived quality of life changes after earthquakes, and perceived social support had a statistically significant association with resilience accounting for 33% of the variance in resilience. Nurses, mental health professionals, and other health care practitioners should consider these findings for promoting the resilience of older disaster survivors and develop multidimensional interventions for their disaster preparedness.

© 2021 Elsevier Inc. All rights reserved.

Introduction

The increase of both the frequency and intensity as well as the extreme effects of natural disasters[1] has been observed globally. Earthquake is one of the catastrophic natural disasters that occurs without warning and results in the loss of life, and causes injury to people, damages shelters, and causes displacement, or evacuation during the emergency phase of the disaster cycle.[2] People from developing countries are the populations most vulnerable to these natural disasters due to limited natural resources and adaptive capacity related to financial constraints.[3] Older people aged 65 years and above[4] have particularly been noted as experiencing negative health consequences before, during, and after disaster events.[5] Consequently, exposure to natural disasters affects their mental health as a long-term impact.[6] Resource caravans (i.e., the accumulated resources) from prior experiences, maturity, and mature coping strategies are required to overcome such adversities in life.[7] However, the previous study has only focused on assessing the psychological comorbidities and distress among older people in disaster mental health research.[8] The positive psychological concepts in disaster-related mental health research among the geriatric population, in terms of the long-term post-disaster recovery, are not yet well-understood, particularly concerning earthquake-related disasters.

Resilience is one of the most important concepts in disaster-related mental health research for identifying the positive psychological characteristics among older people. The word resilience originated from the Latin word *"Salire"* which denotes spring up and *"Resilire"* indicates spring back.[9] Thus, resilience connotes the dynamic ability of the people to respond and bounce back from the adversities in life, reintegrate positively from the altered homeostasis, endure through challenges faced with adversity and come back to the baseline status.[9] Likewise, Connor and Davidson[10] mentioned resilience as the ability to thrive in the face of difficult life circumstances and cope with stressors in life. These concepts of resilience have been adopted for assessing resilience among older disaster survivors.

People may develop resilient reintegration and come back to pre-stressors functioning, or reintegrate with bio-psycho spiritual homeostasis or with loss, or dysfunctionally reintegrate in the face of adversities and stressors in life.[11] Evidence indicated that initiating disaster preparedness activities for older people may facilitate their resilient reintegration during and after a disaster and preparedness to adapt to the adverse effects of future disasters.[12] Thus, resilient older people might be a source of inspiration to others and an invaluable resource that can serve as the guide and strength to their families and the society during disasters.[13] Likewise, internal (i.e., self-efficacy, self-esteem, physical and mental health, and self-reliance) and external (social networks) protective factors might facilitate resilient integration.[9] Several other factors are associated with resilience, such as age[14], marital status[14], gender[14–16], income[17], education[18], comorbidities[19], displacement after a disaster[19], quality of life [QoL][20], limitation in activities of daily living [ADLs][21], depressive symptoms[21], and involvement in rescue activities and witnessing the real-life disasters.[22] A systematic review also revealed that age, gender, marital status, and race (i.e., non-modifiable factors), and social capital, social support, and spirituality (i.e., modifiable factors) were associated with resilience among

*Corresponding author.
E-mail address: praneed.s@psu.ac.th (P. Songwathana).
[1] Associate Professor.

https://doi.org/10.1016/j.gerinurse.2021.08.008
0197-4572/$ – see front matter © 2021 Elsevier Inc. All rights reserved.

older people who survived the natural (i.e., Typhoon Haiyan, hurricane, and floods) and technological disasters.[23]

In addition, social support[15,18,24] as well as community and societal factors such as local government support, governmental social policies, culture, religion[25] and access to health care services[26] and the health care system[27] facilitate individual resilience. Disaster-related experiences such as access to resource centers; types, and severity of the trauma; loss of a close family member and economy; timing of initiation of rescue procedures; and loss of shelter, livelihood, food, and water are also related to individual resilience.[19] Furthermore, the context of adversity[28] and advancing age[29] might influence one's capacity to adapt to adversity in life. However, previous studies have been limited to general disaster events, and not specific to earthquakes, which may lead to greater loss than other types of disaster. In addition, evidence is only available regarding related factors and predictors of resilience, with a lack of evidence among older disaster survivors from the testing of the model of resilience by including the factors mentioned above.

Regarding earthquake experiences, some socioeconomic factors were reported to be related to resilience. A study on adult survivors 18–60 years of age five years after the Sichuan earthquakes revealed that the age, marital status, chronic diseases, and subjective support of females; the support-seeking behaviors of males; and the household income of both males and females were the significant predictors of resilience.[30] It also revealed that having chronic diseases increased resilience among males. A relationship between socioeconomic factors and resilience was also found based on the gender-based comparison.[30] However, there is a lack of evidence focusing on resilience and its associated factors among older disaster survivors, especially on earthquake related disaster.[13,23]

The resilience among Nepalese older people was of great concern for a number of reasons. Nepal is the 11th most earthquake-prone country, along with being the top 20th country in the world facing multi-hazards.[31] The high impact of the loss of life, high numbers of missing and injured people, and the displacement of more than a million families from their hometowns are evidence.[32] The Nepal earthquake of 2015 was particularly devastating; it was responsible for 8,790 deaths and 22,300 injuries.[33] These earthquakes damaged nearly 800,000 homes, including as many as 23% of the homes of older people.[34] In addition, only 60% of the damaged houses have since been constructed,[35] and people are still living in cramped homes[36] and temporary shelters.[37] People of rural communities of the earthquake-affected districts of Nepal are also experiencing financial hardships, limited access to many facilities such as transportation, health care services, and difficulty fulfilling their basic needs. Nepalese people aged 60 years and above tend to experience more severe difficulties during and after disaster than their counterparts in other countries, as reported by the country's ranking in the Help Age Disaster Risk and Age Index (30th among 190 countries).[38]

Accordingly, some relevant factors were selected from the disaster resilience of the place [DROP] model proposed by Cutter et al.[39] and the findings of previous studies to examine their influence on resilience among older people exposed to a disaster. The DROP model addresses federal and state policies and regulations and the other indicators (i.e., ecological, social, economic, institutional, infrastructure, and community competencies indicators) that might significantly influence resilience.[39] Thus, the hypotheses of the study with the selected variables were: (1) socio demographic characteristics (i.e., age, gender, religion, marital status, literacy status, type of family, current regular personal income, and receiving old-age allowances [OAA]); (2) health-related characteristics (i.e., current health problems, problems in performing ADLs, frequent visits to health care center [HCC], and access to HCC), (3) earthquake-related characteristics (i.e., sustaining self-injuries, witnessing the injury to and/or death of family members, witnessing the injury to and/or death of relatives/neighbors, experiencing damage to residence and displacement from the original domicile and QoL changes after 2015 earthquakes), and (4) social characteristic (i.e., perceived social support) had a statistically significant association with resilience among older disaster survivors. In addition, another hypothesis was to test the model (including the factors that have a statistically significant relationship with resilience among disaster survivors) for its model fit. Identifying both modifiable and non-modifiable factors can provide a basis for promoting resilience among older disaster survivors and developing the approach in supporting their ability to cope with disasters as well as their being well-prepared for specific future disasters.[13,40] Therefore, this study aimed to, (1) identify the resilience, (2) examine the factors associated with resilience, and (3) test the model for its fit with the data among older disaster survivors of the Nepal earthquakes of 2015.

Methods

Design and setting

A cross-sectional analytical study was carried out in one of the 14 worst-hit districts of Nepal (i.e., District "A") by the 2015 earthquakes.[41] People in this and surrounding districts were grossly affected by the earthquakes of 2015[42] and the landslides of 2020.[43] This district was the most disaster-prone[42,43] because of its weakened landmass caused by the 2015 earthquakes.[42] This district is characterized by a significant diversity in terms of both geography and ethnic groups, which might be a fair representation of the populations of the 14 earthquake-affected districts of Nepal.

Sample and sampling

This paper is part of a large project of causal modeling for promoting resilience that consisted of 9 explanatory variables (i.e., self-efficacy, self-esteem, social support, spirituality, optimism, mental health, life satisfaction, perceived stress and loneliness). The calculated sample size was 324 (30 participants per explanatory variables [n = 270] based on the recommendation of Nunally and Bernstein (1994 as cited in Norris[44]) with 20% of non-response (i.e., 54 participants) as suggested by Bethlehem.[45] Cluster and stratified random sampling techniques were employed to recruit the 324 participants. An online random number generator[46] was used to generate random numbers. Four steps were applied: 1) *Clusters based on district.* One District "A" was chosen from 14 clusters representing 14 heavily-affected districts by the 2015 Nepal earthquakes via simple random methods using random numbers. 2) *Strata based on municipality/rural municipality.* Three rural municipalities B, C, D, and one municipality E of the selected district were randomly chosen using random numbers. 3) *Strata based on city or village number of the selected municipality and three rural municipalities.* One number representing each municipality was selected randomly using random numbers. (4) *Selection of participant.* The required number of participants was calculated from four strata (B, C, D, and E) using the recommended formula by Stat Trek.[47] Then, an equal proportion of participants (older people), comprising 86, 57, 49, and 132 from those strata, respectively, were selected randomly using a sampling frame.

The older people were recruited based on the following inclusion criteria: aged 65 years and above; able to understand, communicate verbally, and respond to questions in Nepalese; inhabitant of an earthquake-affected area; affected by the above-mentioned disaster (s); and willing to take part in the study. Only one older person from each household was selected randomly to ensure the collection of data corresponding to a greater variety of experiences. Twenty-three of the recruits were excluded due to refusal to participate (n = 9), communications barriers (n = 8), withdrawal from participation

(n = 4), psychiatric co-morbidities and on medications (n = 1), and post-traumatic stress disorder [PTSD] (n = 1) screened by using 5-items Primary Care (PC) PTSD Screen for the Diagnostic and Statistical Manual of Mental Disorders [DSM]-5 [PC-PTSD-5] scale with the dichotomous response having an excellent diagnostic accuracy.[48] Thus, additional participants who met the inclusion criteria were chosen randomly from the sampling frame to compensate until the sample size reached 324.

Instrumentation

The instruments used to collect data comprised three parts.

(1) A 25-item structured questionnaire of socio-demographic, health-related, and earthquake-related characteristics plus 1 item asking about perceived QoL changes after earthquakes (Tables 1 & 2), which was developed in consideration of the literature.[49,50]

(2) The 10 item Connor & Davidson Resilience Scale Nepali Version (CD-RISC-10-NP)[51] was used to assess resilience among older disaster survivors. The responses ranged from 0 (not true at all) to 4 (true nearly at all the time); the total scores range from 0 to 40. The level of resilience was categorized based on median and quartile scores. The 1st quartile represented low resilience, the 2nd and 3rd quartiles indicated an intermediate level of resilience, and the 4th quartile described the highest resilience level.[52]
Regarding the development of CD-RISC-10, Campbell-Sills and Stein[53] reanalyzed the factor structure of the 25 item CD-RISC and retained 10 items only and reported the factor loadings greater than 0.4 with determinacy of 0.93 and reliability coefficient of .85, and correlation with the 25 items Connor & Davidson Resilience Scale (CD-RISC-25). In addition, CD-RISC-10 was found reliable and valid among earthquake survivors in China.[54] Furthermore, Sharma et al.[51] translated and validated the CD-RISC-10 into Nepali language. The findings of confirmatory factor analysis (CFA) by Sharma et al.[51] were χ^2 = 34.33, df = 34, χ^2: df = 1.01, Root Mean Square Error of Approximation (RMSEA) = .009, Comparative Fit Index (CFI) = .99, along with good to excellent internal consistency reliability (α = .87 to > .90) and test-retest stability (r = .89).

(3) The 12-item Multi-Dimensional Scale of Perceived Social Support, Nepali Version (MSPSS-N)[55] was used to assess perceived social support among older disaster survivors. It consists of a 7-point Likert scale ranging from 1 (very strongly disagree) to 7 (very strongly agree) with three subdomains (family, friends, and significant other). The total scores range from 12 to 84. The interpretation of the MSPSS-N scores is as follows: 12–35 (low perceived support), 36–60 (medium perceived support), and 61–84 (high perceived support).[56] Concerning the development of MSPSS, Zimet et al.[57] developed this instrument and reported its internal consistency reliability (α = .88) and the test-retest reliability after 2 to 3 months with the construct validity with Hopkins Symptom Checklist. In addition, Tonsing et al.[55] translated and tested the MSPSS into the Nepali language (MSPSS-N) among 153 Nepalese people and reported the MSPSS-N as a reliable and valid

Table 1
Socio-demographic and Health-related Characteristics of Participants (N = 324)

Variables	*N*	(%)
Socio-demographic Characteristics		
Age (years)		
65–74	188	(58.0)
75–84	113	(34.9)
85 and above	23	(7.1)
Gender		
Male	151	(46.6)
Female	173	(53.4)
Religion		
Hindu	274	(84.6)
Buddhist	28	(8.6)
Christian	22	(6.8)
Marital Status		
Married	169	(52.2)
Widowed/Separated/Divorced/Unmarried	155	(47.8)
Literacy Status		
Illiterate	253	(78.1)
Literate	71	(21.9)
Type of Family		
Nuclear	151	(46.6)
Joint	173	(53.4)
Current Regular Personal Income		
Yes	103	(31.8)
No	221	(68.2)
Receiving OAA		
Yes	223	(68.8)
No	101	(31.2)
Health-related Characteristics		
Current Health Problems		
Yes	293	(90.4)
No	31	(9.6)
Problems in Performing ADLs		
Yes	171	(52.8)
No	153	(47.2)
Frequent Visits to HCC		
Yes	205	(63.3)
No	119	(36.7)
Had Access to HCC		
Yes	248	(76.5)
No	76	(23.5)

Note. Minimum to maximum age: 65 to 99, Mean age in years, *SD*: 74.08, 6.73.

Table 2
Earthquake-related Characteristics and Level of Perceived Social Support of Participants (N = 324)

Variables	*N*	(%)
Self-Injured		
Yes	34	(10.5)
No	290	(89.5)
Witness of Injury to and/or Death of Family Members		
Yes	50	(15.4)
No	274	(84.6)
Witness of Injury to and/or Death of Neighbors/Relatives		
Yes	61	(18.8)
No	263	(81.2)
Displacement from Original Domicile after Earthquakes		
Yes	79	(24.4)
No	245	(75.6)
Received Mental Health Support after Earthquakes		
Yes	48	(14.8)
No	276	(85.2)
Received Financial Support from Government of Nepal after Earthquake		
Yes	298	(92.0)
No	26	(8.0)
Participation in Activities for Mental Health Promotion after Earthquake		
Yes	73	(22.5)
No	251	(77.5)
Earthquake Damage to Residence		
Minor/Moderate	62	(19.1)
Complete Destruction	262	(80.9)
Perceived QoL After Earthquakes		
Worse	131	(40.4
About the Same	58	(17.9)
Slightly Better/Better	135	(41.7)

instrument. Likewise, MSPSS-N was found to be reliable (α = .89) among disaster survivors with spinal cord injury.[15]

In this study, the CD-RISC-10 and MSPSS were validated by three experts in mental health and geriatrics. The reliability coefficients of CD-RISC-10-NP and MSPSS-N were 0.89 and 0.93 respectively among 37 older disaster survivors following the suggestions of Perneger et al.[58] Additionally, the psychometric properties of CD-RISC-10-NP and MPSS-N among 324 older people in the current study indicated an acceptable level (see Tables 6 & 7).

Data collection procedure

Considering the geographical variability, pandemic situation, transportation difficulties, and suggestions of administrative authorities, five local research assistants [RAs] having at least diploma level education and residing in four different selected settings were recruited for data collection. The RAs were intensively trained by the primary researcher [PR] through video clips, guidelines, and a checklist regarding data collection procedures, face-to-face discussion concerning informed consent, data collection instruments, and tips on effective communication techniques. The process of inter-rater reliability between the PR and RAs was performed to ensure consistency in the data collection. The data were collected during August to October 2020 through a face-to-face interview at the home of each respondent which took 45 minutes to complete. Each interview schedule was checked for completeness and accuracy by the PR and RAs. Central editing of the interview schedules was also done to identify any missing information and errors to prepare for data analysis.

Data analysis

Data were analyzed in SPSS Statistics for Windows, version 16.0 software (SPSS Inc., Chicago, Ill., USA), using descriptive statistics such as frequency, percentage, mean, standard deviation, skewness, and kurtosis to describe socio-demographic, health-related, and earthquake-related characteristics as well as the level of resilience and perceived social support. Furthermore, the relationships between variables and multi-collinearity were examined using Pearson product-moment correlation and point-biserial correlation analysis. Then, all the variables correlated with resilience were entered into the model to perform multiple linear regression analysis to determine the predictors of resilience after testing all the assumptions (see Table 5). Path analysis with maximum likelihood estimation (see Fig. 1) was performed using Confirm IBM SPSS Analysis of Moment of Structures [AMOS] version 21 software (Amos Development Corporation, USA) to identify the factors that had significant effects on

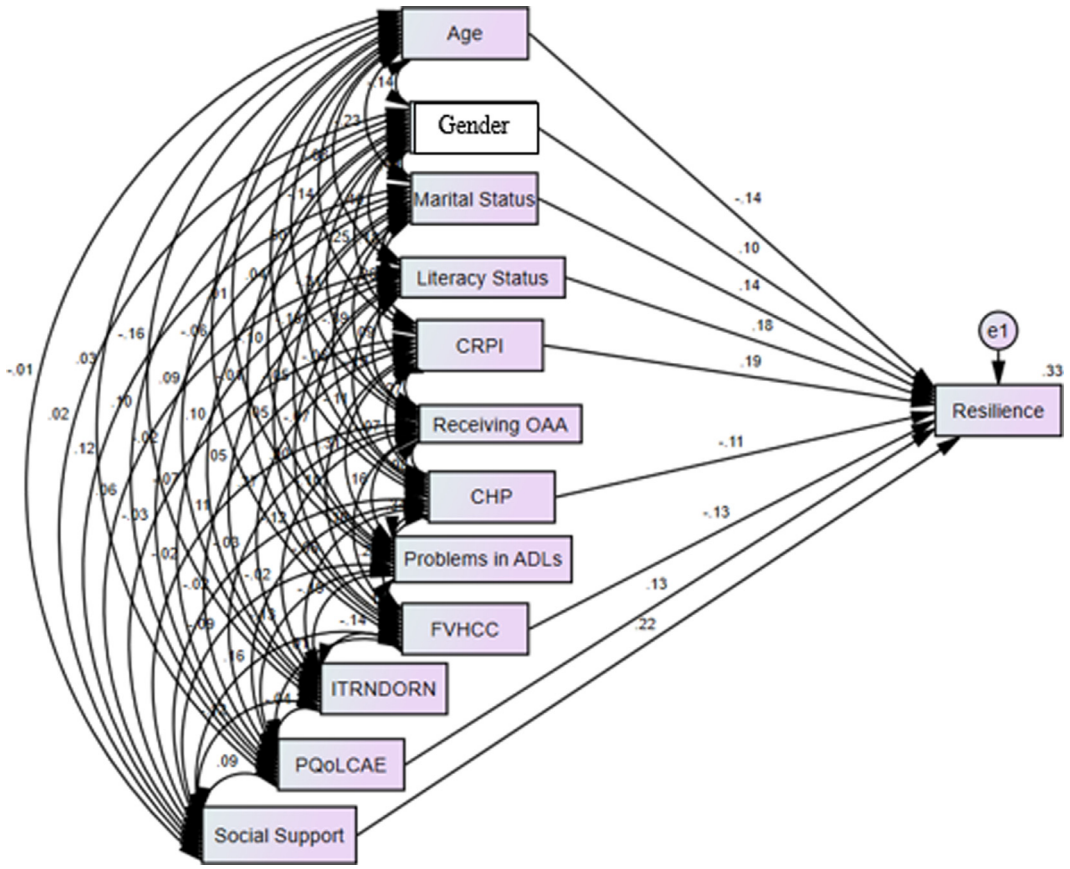

Fig. 1. Path Analysis of Socio-demographic, Health-Related and Earthquake-Related Characteristics and Perceived Social Support Variables Predicting Resilience (N = 324)

Note. Highly non-significant three paths (problems performing activities of daily living, receiving old-age allowances, and injury to /deaths of neighbors and relatives) were deleted from the model. Chi-Square = 5.17 (p = .160), χ^2: *df* ratio = 5.17/3 (1.72), *GFI* = .99, *AGFI* = .93, *SRMR* = .0095, *RMSEA* [*CI*], *PCLOSE* = .05 [.00, .11], 435, *CFI* = .99, *NFI* = .99, and *NNFI* = .91. ITRNDORN: Injury to and/or Deaths of Relative/Neighbor. PQoLCAE: Perceived Quality of Life Changes After Earthquakes. FVHCC: Frequent Visits to HCC. CRPI: Current Regular Personal Income. CHP: Current Health Problems.

Criteria for model fit indices: Goodness of Fit Index (GFI) = >.90[80]; Adjusted Goodness of Fit Index (AGFI) = >.80 (Hu &Bentler, 1999 as cited in Azman[81]) and > .90[80]; Standardized Root Mean Square Residual (*SRMR*) = <.05 and Root Mean Square Error of Approximation (*RMSEA*) = < .05 to .08[79]; Comparative Fit Index (*CFI*) = >.95 and Normed Fit Index (*NFI*) = >.95 [superior fit][79, 80] and Non-Normed Fit Index (*NNFI*) = >.9 and χ^2 with significant p-value (expected with > 250 samples)[80] and Normed Chi-Square (χ^2: df ratio) = < 5.0 (Wheaton et al, 1977 as cited in Azman[81]).

resilience and test the model for its fit with the data. Then, the significance of the relationships was interpreted based on a *p*-value of ≤ .05 at a 95% confidence level.

Ethical considerations

Ethical approval was obtained from the Center for Social and Behavioral Sciences Institutional Review Board, Faculty of Nursing, Prince of Songkla University (PSU), Thailand (Document No. 2020NS: Qn005), and the Nepal Health Research Council, Nepal (Ref. No. 2114). In addition, permission was obtained from the administrative authority of the rural municipalities as well as the municipality of District "A", Nepal. Written informed consent from literate participants or an authorized witness (i.e., family members of illiterate participants) and verbal informed consent from illiterate participants were obtained. Confidentiality and anonymity were assured by giving each respondent a code number, and keeping the consent form separate from the interview schedules.

In terms of beneficence, individual health education on the ways of promoting mental health (via a booklet) along with prevention and control of corona virus disease, 2019 (COVID-19) in consideration of the ideas and practices of the participants was provided to each respondent after completing the interview session. The right to fair treatment was ensured by providing 100 NPR (Nepalese rupee) to each respondent as a small token of appreciation for their valuable contribution. To help control and prevent COVID-19 infection during the time of data collection, procedures in full compliance with the WHO, national, and local guidelines were strictly adhered to. The PCR tests prior to entering each setting were performed (i.e., negative test reports), as well as practicing physical distancing, wearing a face mask, using alcohol-based hand wash, and providing a face mask to each respondent to wear during the interview.

Results

Respondent characteristics

Table 1 shows the highest percentage of participants belonged to the 65 to 74-year-old age group (58.0%) with a mean age of 74.08 years (SD = 6.73). The participants were predominantly female (53.4%), Hindu (84.6%), married (52.2%), and illiterate (78.1%); lived in joint (53.4%) and nuclear (46.6%) families; and had current health problems (90.4%) and difficulties performing ADLs (52.8%). In addition, the majority of participants received OAA (68.8%), visited HCC frequently (63.3%), and had access to HCC (76.5%). But the majority of them did not have any current regular personal income (68.2%).

Table 2 reveals that most of the participants had not experienced injury to self (89.5%). Some of them had witnessed injury to and/or death of family members (15.4%), and witnessed injury to and/or death of neighbors/relatives (18.8%). The majority of them were not displaced from their original domicile after the earthquakes (75.6%); although they had suffered complete destruction of their abode (80.9%); and had not received any formal mental health support (85.2%) or benefited from any activities of mental health promotion (77.5%) after the earthquake. However, most of them had received financial support from the government (92%), while some participants perceived a worse (40.4%) and slightly better/better QoL (41.7%) after the earthquakes its nearly equal proportions.

Level of resilience and perceived social support

Table 3 exhibits that 59.6% of participants reported a high level of perceived social support with an overall mean score of 58.52 (*SD* ± 17.11). Nearly half of the participants had a resilience of an intermediate level with an overall mean score of 20.28 (*SD* ± 8.78) with scores ranging from 0–40.

Table 3
Participants' Level of Perceived Social Support and Resilience (N = 324)

Variables	*N*	(%)
Level of Perceived Social Support [a]		
Low (< 35)	34	(10.5)
Medium (36–60)	97	(29.9)
High (> 61–84)	193	(59.6)
Level of Resilience [b]		
Low (≤ 14 [based on 1st quartile])	93	(28.7)
Intermediate (15 to 26 [based on 2nd and 3rd quartiles])	157	(48.5)
High (>26 [based on 4th quartile])	74	(22.8)

[a] $\bar{x}$ (*SD*): 58.52, 17.11.
[b] $\bar{x}$ (*SD*) = 20.28 (8.76).

Factors associated with resilience

Table 4 illustrates that only gender (r_{pb} = .33, *p* = .000), marital status (r_{pb} = .32, *p* = .000), and current regular personal income (r_{pb} = .31, *p* = .000) had a moderate positive relationship with resilience. Other factors showed a weak relationship with resilience (see Table 4).

The results showed that marital status [β = .14, *p* = .007], literacy status [β = 18, *p* = .000], current regular income [β = .19, *p* = .000]), perceived quality of life changes after earthquakes [β = .13, *p* = .006]), and social support [β = .22, *p* = .000] had statistically significant positive effects on resilience (see Table 5, Fig. 1). Age [β = -.14, *p* = .004], current health problems [β = -.11, *p* = .017], and frequent visit to HCC [β = -.13, *p* = .006] had significant negative effects on resilience. Except for perceived social support with resilience which had a medium size relationship, all the other significantly associated variables had a low size relationship (see Table 5, Fig. 1). The above-mentioned factors also showed the model fit with the empirical data (χ^2 = 5.17 [*p* = .160]), χ^2: *df* = 1.72, *GFI* = .99, *AGFI* = .93, *RMSEA* = .05 [.00, .11], *SRMR* = .01, *CFI* = .99, *NFI* = .99, *NNFI* = .91) (see Fig. 1) that explained 33% of the total variance on resilience.

Discussion

In this study, the majority of participant were Hindu and aged 65 to 74 years, with almost equal proportions of males and females. The findings on religion and gender in the present study concur with the national and District "A" profile.[59] However, the percentage of participants in the age group of 65 to 74 years (58.0%) was slightly lower in the current study compared to the national (67.9%) and district profile (64.3%).[59] But, the proportion of participants aged 65 to 74 years in this study was higher than the participants aged 75 years and above.

The majority of participants reported having resilience at an intermediate level (i.e., neither low nor high level of resilience). This finding is similar to Wagle et al.[60] who found that older people residing in the urban setting of the earthquake-affected district had a moderate level of resilience after two years of Nepal earthquakes. Our older people living in a rural setting, who were in the recovery/reconstruction phase 5 years after the 2015 Nepal earthquakes, did not have as high a level of resilience as expected due to some reasons. The residences of nearly 81% of participants in the present study were destroyed, and 92% of them had received some financial but little informal mental health (14.8%) support. Furthermore, a sizable proportion of the Nepalese population live under the poverty line (25.2%) and are fully dependent on internal and external support systems.[61] However, the government of Nepal provided an insufficient grant to their citizens to rebuild their houses after the earthquake.[36] Additionally, the government of Nepal's involvement in

Table 4
Correlation of Socio-demographic, Health-Related and Earthquake-Related Characteristics and Perceived Social Support with Resilience (N = 324)

Variables	Correlation with Resilience	
	r	*p*
Socio-demographic Characteristics		
Age (years)[a]	-.22	.000***
Gender (1 = Male, 0 = Female) [b]	.33	.000***
Religion (1 = Hindu, 0 = Others) [b]	.05	.363
Marital Status (1 = Married, 0 = Unmarried/Widowed/Divorced/Separated) [b]	.32	.000***
Literacy Status (1 = Literate, 0 = Illiterate) [b]	.29	.000**
Type of Family (1 = Joint/Extended, 0 = Nuclear) [b]	-.06	.258
Current Regular Personal Income (1 = Yes, 0 = No) [b]	.31	.000***
Receiving OAA (1 = Yes, 0 = No) [b]	-.22	.000***
Health-related Characteristics		
Current Health Problems (1 = Yes, 0 = No) [b]	-.21	.000***
Problems Performing ADLs (1 = Yes, 0 = No) [b]	-.22	.000***
Frequent Visits to HCCs (1 = Yes, 0 = No) [b]	-.12	.029*
Access to HCCs (1 = Yes, 0 = No) [b]	.10	.061
Earthquake-related Characteristics		
Self-injured (1 = Yes, 0 = No) [b]	-.01	.894
Witness of Injury to and/or Death of Family Member (1 = Yes, 0 = No) [b]	.02	.711
Witness of Injury to and/or Death of Neighbor/Relative (1 = Yes, 0 = No) [b]	.18	.001**
Displacement from Original Domicile after Earthquakes (1 = Yes, 0 = No) [b]	.06	.323
Earthquake Damage to Residence (1 = Complete Destruction, 0 = Minor/Moderate Damage) [b]	-.04	.522
Perceived QoL Changes After Earthquakes (1 = Slightly Better/Better, 0 = Worse/About the Same) [b]	.16	.004**
Perceived Social Support [a]	.24	.000***

[a] = Pearson correlation.
[b] = Point-biserial correlation.
* Correlation significant at the .05 level (2-tailed).
** Correlation significant at .01 level (2-tailed).
*** Correlation significant at < .001 level (2-tailed). ADLs: Activities of Daily Living. OAA: Old Age Allowances. HCC: Health Care Center.

Table 5
Standardized Regression Estimates of Socio-demographic, Health-Related and Earthquake-Related Characteristics and Perceived Social Support with Resilience

Variables	Estimate	*SE*	*CR*	*β*	*p*
Socio-demographic Characteristics					
Age (years)	-.18	.06	-2.91	-.14	.004
Gender [a]	1.72	.97	1.76	.10	.078
Marital Status [a]	2.46	.92	2.68	.14	.007
Literacy Status [a]	3.81	1.07	3.57	.18	.000
Current Regular Personal Income [a]	3.45	.91	3.80	.19	.000
Health-Related Characteristics					
Current Health Problems [a]	-3.37	1.41	-2.39	-.11	.017
Frequent Visit to HCC [a]	-2.36	.87	-2.73	-.13	.006
Earthquake-Related Characteristics					
Perceived Quality of Life Changes After Earthquakes [a]	2.27	.83	2.73	.13	.006
Perceived Social Support	.11	.02	4.67	.22	.000

[a] Dummy Coded Variables (as shown in Table 4). Achieved Assumptions for Multiple Regression Analysis: No Missing Data, No Outlier Based on Standardized Residual Value Within ± 3.3 and Case-Wise Diagnostics, Normality by Skewness and Kurtosis Value, Linearity by Bivariate Scatter Plots, Homoscedasticity by Multivariate Scatter Plot of the Standardized Residuals, No Autocorrelation [Durbin Watson = 1.58], No Multi-collinearity Based on Correlation Among Independent Variables (r = between .001 to .505), Tolerance [.60 to .94] and VIF [1.07 to 1.66]. HCC: Health Care Center. *CR* values beyond ± 1.96 establishing significance at $p < .05$ level.[79] $R^2 = .33$.

reconstruction activities is slow because of political unsteadiness, confusion, and bureaucracy.[36] Consequently, the people of Nepal, including older people, continue living in cramped homes to this day.[36] Furthermore, COVID-19 poses other challenges for the Nepalese people,[37] including all reconstructive work being suspended.[62] It can also be said that the aftermath of other types of natural disasters, such as the landslides and floods in 2020[63], as well as fears related to the COVID-19 pandemic during the time of data collection, may have a detrimental effect on the participants' resilience level. In addition, factors like people's socio-economic status and ability for physical adaptation to disasters[64], political crisis or instability, financial constraints, and the structures of the government and/or existing institutions[65] might influence not only the recovery process of disaster survivors but also the risks of future disasters. Therefore, all of the above-mentioned situations might be the reasons why our participants did not have high resilience after five years of the Nepal earthquakes 2015.

The study findings are dissimilar with those of some previous studies that reported high resilience scores among older disaster survivors.[14,66] The differences in resilience scores across studies might be related to different geographical settings and instruments utilized to measure resilience outcomes[30]; the socio-economic, environmental, and institutional factors of regions and localities; timely emergency response and relief efforts; recovery measurement[67]; and exposure to other disasters during the recovery period. The intermediate level of resilience in our study population was found when considering the low level of support compared to those previous studies.

The current study reports that age had a statistically significant negative effect on resilience. The more advanced the age, the lower the resilience level. This finding is in line with the results reported by Liddell and Ferreira[14], who emphasized that advancing age decreases resilience scores. Hence, the findings of this study refute the inoculation hypothesis discussed by Palgi et al.[7], who mentioned that older people are more resilient because of their coping styles, maturity, prior experiences, social support, flexibility, and emotional regulation. Gender did not have a statistically significant effect on resilience. Gender-based differences in resilience have been found by other studies conducted among adult earthquake survivors.[15,22,30] However, our study focused on older people who survived a disaster, who might have other factors that affect resilience, such as socioeconomic factors and diminished functional ability based on the resource theory.[7] So, these might be the most plausible reasons in this study for not revealing a significant effect of gender on resilience.

Likewise, marital status had a statistically significant positive effect on resilience. In addition, the resilience scores tended to be higher among married participants. This finding is also supported by the

Table 6
Frequency, Percentage, Mean, Standard Deviation, Skewness, Kurtosis and Factor Loadings of Each Items of Multidimensional Scale of Perceived Social Support (N = 324)

S. N.	Statements	Very Strongly Disagree (1) %	Strongly Disagree (2) %	Mildly Disagree (3) %	Neutral (4) %	Mildly Agree (5) %	Strongly Agree (6) %	Very Strongly Agree (7) %	*M*	*SD*	Skewness	Kurtosis	Factor Loadings
1.	There is a special person who is around when I am in need. [a]	17.6	2.2	2.5	2.5	42.0	19.1	14.2	4.63	1.94	-.90	-.38	.83
2.	There is a special person with whom I can share my joys and sorrows. [a]	14.8	1.5	4.3	4.6	34.9	26.2	13.6	4.76	1.87	-.99	-.10	.82
3.	My family really tries to help me. [b]	10.8	0.3	1.2	4.0	24.4	37.7	21.6	5.30	1.73	-1.10	.13	.90
4.	I get the emotional help and support I need from my family. [b]	11.4	1.5	1.5	1.5	22.3	38.0	23.5	5.30	1.81	-1.21	.40	.87
5.	I have a special person who is a real source of comfort to me. [a]	13.9	0.9	4.3	4.0	31.5	29.9	15.4	4.90	1.85	-1.50	1.43	.81
6.	My friends really try to help me. [c]	18.8	1.5	4.3	6.8	41.0	18.8	8.6	4.41	1.89	-1.45	1.05	.86
7.	I can count on my friends when things go wrong. [c]	18.2	3.4	4.3	8.0	37.0	19.8	9.3	4.39	1.92	-1.45	1.01	.85
8.	I can talk about my problems with my family. [b]	11.7	1.5	0.3	3.4	19.8	35.5	27.8	5.35	1.85	-1.30	.62	.85
9.	I have friends with whom I can share my joys and sorrows. [c]	18.2	1.2	1.9	5.2	35.8	22.5	15.1	4.67	1.97	-.80	-.56	.88
10.	There is a special person in my life who cares about my feelings. [a]	14.2	1.2	1.5	1.9	35.5	29.6	16.0	4.96	1.85	-.72	-.70	.81
11.	My family is willing to help me make decisions. [b]	13.0	0.6	2.2	4.3	23.8	37.0	19.1	5.13	1.84	-.91	-.40	.84
12.	I can talk about my problems with my friends. [c]	17.9	-	1.2	4.3	40.4	22.5	13.6	4.71	1.91	-1.03	-.10	.87

Note. For the factor analysis, the recommended value of the Kaiser-Meyer-Olkin (KMO) test is .80 reflecting the sample adequacy[82] with the significant Bartlett's Test of Sphericity.[83] KMO values = .91 and Bartlett's Test of Sphericity = χ^2 = 3810.55, *df* = 66 (*p* = .000)] of MPSS-N. Based on scree plot and Eigen value greater than 1: three factors of 12 items of MPSSN with four-items for each factor. Eigen Value, % of Variance, and Cumulative %

[a] Factor 1 (Significant Others) = 1.41, 11.75%, 84.00%

[b] Factor 2 (Family) = 1.67, 13.89%, 72.25%, and

[c] Factor 3: Friend = 7.00, 58.36%, 58.36%, respectively. CFA: *GFI* = .92, *AGFI* = .87, *SRMR* = .03, *RMSEA* [*CI*] = .08 [.07, .10], *CFI* = .97, *NFI* = .96, and *NNFI* = .96 with χ^2 = 169.70, *df* = 51, *p* = .000; χ^2: *df* ratio = 3.33. *CI* = Confidence Interval. Reliability Coefficient = .93.

'Marriage Protection Explanation' of Hagedoorn et al.[68] and the 'Marriage Resource Model' of Williams and Umberson.[69] In addition, social scientists have predicted that, because married people are more likely than their counterparts to have more intimate relationships (i.e., with their spouse), better social support, larger social networks, more public commitments, and receive care and comfort from their partner, they tend to be more resilient.[70] In the Nepalese context, most older people are deprived of private savings, a pension, social security, or support from the public health system. Therefore, living with a spouse may be a more significant protective factor in terms of resilience later in life. That way, they may receive economic, social, and physical support from their spouse. This might be the most likely explanation why our married participants had higher resilience scores than those who did not live with a partner. However, this finding was different from that reported by Ni et al.[30] showing a significantly lower resilience scores among married adults who had survived the Sichuan earthquake. This incongruence could be explained partly by the differences in age groups between the studies.

The current study also reports that literacy status had a statistically significant positive effect on resilience. This finding is consistent with that of Schwind et al.[22] who found higher resilience scores among literate earthquake survivors. A study by Hoffman and Blecha[71] supported that educated people have better knowledge, capabilities, perceptions, and skills that render them better prepared to cope with and adjust to a given disaster. This further promotes an effective response on their part to warnings; enhances their appropriate understanding of the situation they face; provides them with better accessibility to and mobilization of social, material, and informational resources; which ultimately lowers their vulnerability to disasters. This might be the reason why the literate participants reported a higher level of resilience than the illiterate ones. Similarly, having chronic health problems was related to lower resilience scores, which is supported by a systematic review[72] and a study among female earthquake survivors.[30]

In addition, having a current regular personal income was the predictor of resilience and associated with higher resilience scores than lacking such income. This finding is in line with those of previous studies.[17,30] Likewise, Hoffmann and Blecha[71] have suggested that economic resources facilitate disaster preparedness activities via structural adjustment during residence reconstruction and relocation from disaster risk zones. The current study shows that receiving OAA did not statistically significantly predict resilience. The reasons might be related to the age factor and the insufficient amount of OAA distributed by the government of Nepal. In addition, 61.7% of the participants in the previous study[73] mentioned that OAA for those of an age over 70 years was not sufficient to meet their daily expenses, and that it was difficult to receive those allowances because of long waiting hours at the distribution offices.

The current study shows that the frequent visits to HCC had a statistically significant negative effect on resilience. Higher resilience scores were reported among participants who did not visit HCC frequently compared to those who did. Customarily, Nepalese older people with chronic health problems and who are on medication tend to visit HCC on a regular basis.[74] Although an integrated mental health care approach is employed at primary health care facilities to fill the treatment gap between the mental health service demands and the accessibility and availability of mental health services, this approach is yet to yield the expected benefits in respect to the mental health service coverage in Nepal.[75] Additionally, due to the lack of formal mental health support for our participants after the earthquake, the resilience scores tended to be low even though they have visited HCC frequently.

Being a witness of injury to and/or the death of relatives/neighbors during the earthquakes did not have a statistically significant effect on resilience, which was consistent with the results reported by Ni et al.[30]

Table 7
Frequency, Percentage, Mean, Standard Deviation, Skewness, Kurtosis and Factor Loadings of Each Items of Connor-Davidson Resilience Scale -10 (N = 324)

S. N.	Statements	Not true at all (()) %	Rarely True (1) %	Sometimes True (2) %	Often True (3) %	True Nearly all the time (4) %	*M*	*SD*	Skewness	Kurtosis	Factor Loadings
1.	Ability to adapt	40.7	16.4	17.9	13.0	12.0	1.39	1.43	.55	-1.07	.73
2.	Can deal with whatever comes	25.0	17.3	25.9	17.9	13.9	1.78	1.37	.13	-1.17	.79
3.	Try to see the humorous side of things	8.6	6.5	35.5	28.4	21.0	2.47	1.15	-.49	-.29	.50
4.	Cope with stress	17.3	12.0	30.2	22.8	17.6	3.11	1.32	-.20	-.10	.72
5.	Tend to bounce back	18.8	14.2	30.9	19.8	16.4	2.01	1.32	-.08	-1.04	.71
6.	Believe the ability to achieve	18.2	14.5	28.4	19.1	19.8	2.08	1.36	-.10	-1.12	.80
7.	Stay focused and think clearly	14.2	14.5	31.2	20.4	19.8	2.17	1.30	-.16	-.96	.76
8.	Am not easily discouraged	30.2	13.0	34.0	12.7	10.2	1.60	1.31	.24	-.99	.45
9.	Think of myself as a strong person	20.4	12.0	30.2	22.2	15.1	2.00	1.33	-.13	-1.06	.71
10.	Able to handle	5.9	8.6	26.2	30.6	28.7	2.66	1.15	-.62	-.34	.47
	Eigen Value										4.58
	% of Variance										45.81
	Cumulative %										45.81

Note. KMO values = .90 and Bartlett's Test of Sphericity: χ^2 = 1151.13, df = 45 (p = .000)]. Based on eigenvalue greater than 1 and scree plot: one factor of 10 items scale. CFA: *GFI* = .95, *AGFI* = .92, *SRMR* = .04, *RMSEA* with *CI* = .07 [.05, .08], *CFI* = .95, *NFI* = .93, and *NNFI* = .94 with χ^2 = 86.31, *df* = 35, *p* = .000; χ^2: *df* ratio = 2.47. Reliability Coefficient = .86.

However, a statistically significant positive correlation of being a witness of injury to and/or the death of relatives/neighbors during the earthquakes and resilience wad found in this study. This finding is similar to a previous study[22] conducted among Nepalese earthquake survivors of 18–85 years of age 1 year after the 2015 earthquakes, which found that exposure to rescue attempts, witnessing the death of others, and involvement in the management of dead bodies promoted the resilience level of disaster survivors. This finding is also supported by the conservation of resources (COR) theory that stated the defensive response, i.e., active coping during a resource deficient situation.[76] In addition, those who witnessed the injury to and/or death of relatives/neighbors during earthquakes calmed their minds and consoled themselves regarding their loss when recalling having seen other families lose their loved ones and property due to earthquakes. Additionally, they coped with post-earthquake situations more easily when participating in the distribution of relief aid, the management of dead bodies, and the funeral activities for the deceased. Owing to these repeated experiences, they expressed that they harbored no fear or anxiety regarding their loss, future disasters, or the ensuing negative repercussions that might befall them. Instead, they considered these experiences to be a source of strength, which would help them cope with any situation they might encounter in the future, even the consequences of future disasters.

In addition, a non-significant relationship was found when taking into account damage sustained by one's residence. This finding is in contrast with the previous study among the Nepalese earthquake survivors one year after whose abodes were significantly damaged.[22] However, 5 years after the 2015 earthquakes, i.e., the time when this study was conducted, most of the older people had received substantial support in having their earthquake-proof houses built. This is a possible reason for the level of damage sustained by one's residence not leading to a statistically significant relationship with resilience in the current study.

Perceived QoL changes after earthquakes had a statistically significant positive effect on resilience. Informally, the participants reported a slightly better/better quality of life after earthquakes because of the relief support that they had received from several sources such as the government, national and international non-governmental organizations, and banks, as well as their ability to have an earthquake-proof concrete house built. Furthermore, some of them perceived earthquakes as an opportunity for the development of their communities and families; some pointed out that their community had been transformed as a result of the reconstruction and development activities undertaken after the earthquakes. Therefore, this might explain why the perceived QoL changes after earthquakes contributed to the resilience of the participants in the current study. Since this is a novel finding, further research is required to explore this relationship.

Finally, our study found perceived social support as a statistically significant positive effect on resilience. This is an identical finding with previous studies,[15,24] which highlighted social support as a valuable protective factor for enhancing resilience among disaster survivors. Ni et al.[30] also reported that support-seeking behaviors among males and the perceived level of support among females were significant predictors of resilience among disaster survivors. In addition, Southwick et al.[77] reported that the social systems that encircle people enable them to adapt to traumatic events and life stressors. Therefore, this might be the reason for revealing the statistically significant predictive relationship of social support with resilience.

Strengths

The strengths of the study consists it applying a probability sampling technique to select both the setting and participants. Thus, its findings provide a fair representation of and can be generalized to the older people residing in the 14 districts of Nepal, which were

heavily affected by the 2015 earthquakes. This study used the standard instruments that had construct validity and reliability among older people experiencing disaster.

Limitations

Although our findings add to the existing knowledge in gerontology, there were some limitations. Because of its cross-sectional nature and the fact that the participants were surveyed five years after the 2015 earthquakes, there is possibility that recall bias might have exerted some confounding influence on[1,5,6] the data set. It is also difficult to derive definite conclusions on the direction of causality of the selected independent variables on resilience from only the face-to-face interviews with older people at one point of time. This means that biases might have occurred leading to an inability to arrive at the true resilience level of older people of this study. Since rural people are more vulnerable to disasters,[78] the current study was conducted in a rural setting only. This research did not analyze the effects of other modifiable psychosocial and spiritual variables of resilience. Therefore, future comparative research is warranted to explore psychosocial and spiritual variables and other factors associated with resilience among older people residing in urban and rural communities. A larger sample size is required to be able to generalize results to those who have no disaster experiences, and one of different ethnicities and cultures.

Conclusions

This study concludes that the majority of older disaster survivors had an intermediate level of resilience. Various factors (age, marital status, literacy status, current regular personal income, current health problems, frequent visits to HCC, perceived QoL changes after earthquakes, and perceived social support) were identified as having significant associations with resilience among older disaster survivors. The model with these factors fitted with the empirical data and accounted for 33% of the variance in resilience. In addition, perceived social support was the medium-size statistically significant predictor of resilience. Furthermore, some unique factors such as marital status, frequent visits to HCC, and perceiving QoL changes after earthquakes influenced on the resilience of older disaster survivors. Finally, it is recommended for nurses and other mental health practitioners to consider these factors in the provision of psychosocial education and interventions to older disaster survivors aimed for alleviating their deleterious impacts and promoting both the mental health and resilience. Furthermore, cohort studies would be beneficial in differentiating both the outcomes and determinants of resilience immediately after a disaster as well as during the recovery and reconstruction phases.

Implications

Nepalese older people who have experienced earthquake-related disasters possess a different level (i.e., low, intermediate and high levels) of resilience. Therefore, an adequate knowledge of the associated factors at play is necessary in order to promote their resilience level. Nurses, mental health professionals, other health care practitioners, and policymakers might help enhance their resilience by providing more support services for older people experiencing the disasters. These study results can contribute to nursing practice in terms of the provision of counseling, seeking alternative resources to support specific aspects of care provided in the context of older people, and developing socially appropriate, robust, resilience-promoting intervention programs for older people considering the associated factors of resilience. Furthermore, assessing protective factors for resilience of older disaster survivors should be done on a routine basis as part of nursing practice at geriatric clinics and in the community.

Declaration of Competing Interest

The researchers declare that they have no competing interests.

Acknowledgments

The researchers would like to express their sincere thanks to the Thailand Education Hub for the Southern Region of ASEAN Countries (THE-AC) from the Prince of Songkla University (PSU), Thailand for their financial support. In addition, the authors are grateful to all the administrative authorities of the research settings in Nepal involved and all the respondents of this study. We also thank Assoc. Prof. Dr. Sanguan Lerkiatbundit (Associate Dean of Academic Affairs), Graduate School, PSU, for the statistical guidance. We are grateful to Mr. Edmond Subashi, Mrs. Judith Ann Hall, and Dr. Alan Geater, from PSU, for their editorial assistance.

Funding

The researchers received a research grant from the Graduate School of Prince of Songkla University, Hat Yai, Thailand. However, it did not influence the findings of this study in any way.

CRediT author contribution statement

Rekha Timalsina: Conceptualization, Methodology, Software, Validation, Formal Analysis, Investigation, Resources, Data Curation, Writing -Original Draft, Writing Review & Editing, Visualization, Project Administration. Praneed Songwathana: Conceptualization, Methodology, Validation, Resources, Writing -Original Draft, Writing Review & Editing, Visualization, Supervision, Project Administration. Wipa Sae-Sia: Methodology, Validation, Formal Analysis, Resources, Writing Review & Editing, Visualization, Supervision.

References

1. Coronesea M, Lampertia F, Kellerc K, Chiaromontea F, Roventini A. Evidence for sharp increase in the economic damages of extreme natural disasters. *PNAS USA*. 2019;116(43):21450–21455.
2. World Health Organization. Earthquakes; 2021. https://www.who.int/health-topics/earthquakes#tab=tab_1. Accessed 1 February 2021.
3. Ahsan DA. Does natural disaster influence people's risk preference and trust? an experiment from cyclone prone coast of Bangladesh. *Int. J. Disaster Risk Reduct.* 2014;9:48–57. https://doi.org/10.1016/j.ijdrr.2014.02.005.
4. Ouchi Y, Rakugi H, Arai H, Akishita M, Ito H, Toba K, et al. Redefining the elderly as aged 75 years and older: Proposal from the Joint Committee of Japan Gerontological Society and the Japan Geriatrics Society. *Geriatr Gerontol Int.* 2017;17(7):1045–1047. https://doi.org/10.1111/ggi.13118.
5. Bell AA, Kullgren JT, Solway E, Malani P. Supporting the health of older adults before, during and after disasters; 2019. https://www.healthaffairs.org/do/10.1377/hblog20191126.373930/full/. Accessed 20 May 2020.
6. Tanaka E, Tennichi H, Kameoka S, Kato H. Long-term psychological recovery process and its associated factors among survivors of the Great Hanshin-Awaji Earthquake in Japan: a qualitative study. *BMJ Open*. 2019;9:e030250. https://doi.org/10.1136/bmjopen-2019-030250.
7. Palgi Y, Shrira A, Shmotkin D. Chapter 16 Aging with trauma across the lifetime and experiencing trauma in old age: Vulnerability and resilience intertwined. In: Cherry KE, ed. *Traumatic Stress and Recovery: Coping with Disasters and Other Negative Life Events*. Switzerland: Springer International Publishing; 2015.
8. Parker G, Lie D, Siskind DJ, Martin-Khan M, Raphael B, Crompton D, Kisely S. Mental health implications for older adults after natural disasters: a systematic review and meta-analysis. *Int. Psychogeriatr.* 2016;28(1):11–20. https://doi.org/10.1017/S1041610215001210.
9. Resnick B. Resilience in older adults. *Top Geriatr Rehabil.* 2014;30(3):155–163. https://doi.org/10.1097/tgr.0000000000000024.
10. Connor KM, Davidson J. Development of a new resilience scale: the Connor-Davidson resilience scale (CD-RICS). *Depress Anxiety*. 2003;18(2):76–82. https://doi.org/10.1002/da.10113.
11. Richardson GE. The meta theory of resilience and resiliency. *J. Clin. Psychol.* 2002;58(3):307–321. https://doi.org/10.1002/jclp.10020.
12. Shih RA, Acosta JD, Chen EK, Carbone EG, Xenakis L, Adamson DM, et al. Improving disaster resilience among older adults' insights from public health Departments

and aging-in-place efforts. *Rand Health Q.* 2018;8(1):3. https://www.ncbi.nlm.nih.gov/pmc/articles/PMC6075802/. Accessed 19 October 2019.
13. Cornell VJ, Cusack L, Arbon P. Older people and disaster preparedness: a literature review. *Aust. J. Emerg. Manag.* 2012;27(3):49–53. https://ajem.infoservices.com.au/items/AJEM-27-03-11. Accessed 20 November 2019.
14. Liddell J, Ferreira RJ. Predictors of Individual resilience characteristics among individuals ages 65 and older in post-disaster settings. *Disaster Med Public Health Prep.* 2018;13(2):1–9. https://doi.org/10.1017/dmp.2018.52.
15. Bhattarai M, Maneewat K, Sae-Sia W. Psychosocial factors affecting resilience in Nepalese individuals with earthquake-related spinal cord injury: a cross-sectional study. *BMC Psychiatry.* 2018;18(60):1–8. https://doi.org/10.1186/s12888-018-1640-z.
16. Smith GC, Hayslip B. Chapter 1: Resilience in adulthood and later life: what does it mean and where are we heading? *Annu Rev Gerontol Geriatr.* 2012;32(1):1–28. https://doi.org/10.1891/0198-8794.32.3.
17. Xu J, He Y. Psychological health and coping strategy among survivors in the year following the 2008 Wenchuan earthquake. *Psychiatry Clin. Neurosci.* 2012;66(3):210–219. https://doi.org/10.1111/j.1440-1819.2012.02331.x.
18. Bonanno GA, Galea S, Bucciarelli A, Vlahov D. What predicts psychological resilience after disaster? the role of demographics, resources, and life stress. *J Consult Clin Psychol.* 2007;75(5):671–682. https://doi.org/10.1037/0022-006X.75.5.671.
19. Desousa A, Shrivastava A. Resilience among people who face natural disaster. *JPAN.* 2015;4(1):1–4. https://doi.org/10.3126/jpan.v4i1.16735.
20. Macia P, Barranco M, Gorbena S, Iraurgi I. Expression of resilience, coping and quality of life in people with cancer. *PLoS One.* 2020;15(7)e0236572. https://doi.org/10.1371/journal.pone.0236572.
21. Wang R, Zhang D, Wang S, Zhao T, Zang Y, Su Y. Limitation on activities of daily living, depressive symptoms and suicidal ideation among nursing home residents: the moderating role of resilience. *Geriatr Nurs.* 2020;41(5):622–628. https://doi.org/10.1016/j.gerinurse.2020.03.018.
22. Schwind JS, Norman SA, Brown R, Frances RH, Koss E, Karmacharya D, et al. Association between earthquake exposures and mental health outcomes in Phulpingdanda village after the 2015 Nepal earthquakes. *Community Ment. Health J.* 2019;55(7):1103–1113. https://doi.org/10.1007/s10597-019-00404-w.
23. Timalsina R, Songwathana P. Factors enhancing resilience among older adults experiencing disaster: a systematic review. *Australas. Emerg. Care.* 2020;23(1):11–22. https://doi.org/10.1016/j.auec.2019.12.007.
24. Almazan JU, Cruz JP, Alamri MS, Albougami ASB, Alotaibi JSM, Santos AM. Coping strategies of older adults' survivors following a disaster: disaster-related resilience to climate change adaptation. *Ageing Int.* 2019:1–13. https://doi.org/10.1007/s12126-018-9330-1.
25. Windle G, Bennet KM. Caring relationships: how to promote resilience in challenging times. In: Ungar M, ed. *The Social Ecology of Resilience: A Handbook of Theory and Practice*. New York: Springer; 2012:219–231. https://doi.org/10.1007/978-1-4614-0586-3_18.
26. Coatta KL. A conceptual and theoretical analysis of resilience in the context of aging with multiple morbidities: Simon Fraser University; 2014. http://summit.sfu.ca/system/; Accessed 20 October 2019.
27. Wulff K, Donato D, Lurie N. What is health resilience and how can we build it? *Annu. Rev. Public Health.* 2015;36:361–374. https://doi.org/10.1146/annurev-publhealth-031914-122829.
28. Ungar M. Systemic resilience: Principles and processes for a science of change in contexts of adversity. *Ecol. Soc.* 2018;23(4). https://doi.org/10.5751/ES-10385-230434.
29. Hayman KJ, Kerse N, Consedine NS. Resilience in context: the special case of advanced age. *Aging Ment Health.* 2017;21(6):577–585. https://doi.org/10.1080/13607863.2016.1196336.
30. Ni C, Chow MCM, Jiang X, Li S, Che Pang SM. Factors associated with resilience of adult survivors five years after the 2008 Sichuan earthquake in China. *PLoS One.* 2015;10(3):1–14. https://doi.org/10.1371/journal.pone.0121033.
31. Asian Disaster Preparedness Center, UN Office for Disaster Risk Reduction. Disaster risk reduction in Nepal, Status Report (July 2019); 2019. https://reliefweb.int/report/nepal/disaster-risk-reduction-nepal-status-report-july-2019. Accessed 20 November 2020.
32. Sharma R. Why is Nepal failing to protect people from floods? what should be done? 23 September 2020. https://english.onlinekhabar.com/why-is-nepal-failing-to-protect-people-from-floods-what-should-be-done.html. 20 November 2020.
33. Dahal HR, Kumar DS, Thapa DK. Prevalence and risk factors of post-traumatic stress disorders among the survivors of 2015 Nepal earthquake, in Dhading, Nepal. *Sleep and Hypnosis J. Clin. Neurosci. Psychopathol.* 2018;20(2):1–12. https://doi.org/10.5350/Sleep.Hypn.2017.19.0145.
34. United Nations Development Programme. Recovery and resilience; 2020. https://www.np.undp.org/content/nepal/en/home/projects/bbb.html. Accessed 20 December 2020.
35. Sijapati A. Rebuilding five years after 2015 quake: a new Disaster Management Authority has taken over to prepare for the next big earthquake; 2020. https://www.nepalitimes.com/banner/rebuilding-five-years-after-2015-quake; 2020 Accessed 20 December 2020.
36. Presse AF. Quake survivors struggle in crammed homes, housing grant insufficient. *The Himalayan.* 2020. https://thehimalayantimes.com/kathmandu/quake-survivors-struggle-in-crammed-homes-housing-grant-insufficient/.
37. Michaels L. Still Recovering from the Earthquake, Nepal Faces Covid-19; 2020. https://asiafoundation.org/2020/04/15/still-recovering-from-the-earthquake-nepal-faces-covid-19/. Accessed 10 May 2020.
38. Help Age International. Disaster risk and age index ranking table; 2015. https://www.helpage.org/what-we-do/climate-change/. Accessed 25 August 2019.
39. Cutter SL, Barnes L, Berry M, Burton C, Evans E, Tate E, et al. A place-based model for understanding community resilience to natural disasters. *Glob. Environ. Change.* 2008;18(4):598–606. https://doi.org/10.1016/j.gloenvcha.2008.07.013.
40. Johnson HL, Ling CG, McBee EC. Multi-disciplinary care for the elderly in disasters: an integrative review. *Prehosp Disaster Med.* 2015;30(1):72–79. https://doi.org/10.1017/S1049023X14001241.
41. Asian Disaster Reduction Center. Nepal: Flood, landslide: 2020/06. https://www.adrc.asia/view_disaster_en.php?NationCode=&Lang=en&Key=2400. Accessed 22 December 2021.
42. European Commission's Directorate-General for European Civil Protection and Humanitarian Aid Operations. Nepal - Landslides (ECHO Daily Flash of 14 September 2020. https://reliefweb.int/report/nepal/nepal-landslides-echo-daily-flash- Accessed 22 December 2021.
43. Khatri PP. 11, 100 Sindhupalchowk households at risk of landslides: Report. The Rising Nepal; 2020. https://risingnepaldaily.com/main-news/11100-sindhupalchowk-households-at-risk-of-landslides-report 2020 Accessed 22 December 2021.
44. Norris AE. Path analysis. In: Kellar SP, Kelvin EA, eds. *Statistical Methods for the Health Care Researcher*. 6th ed. Wolter Kluwer Health /Lippincott Williams & Wilkins; 2013:399–418.
45. Bethlehem J.*Applied survey methods a statistical perspective: non-response; 2009.* http://www.applied-survey-methods.com/. Accessed 1 November 2019.
46. Stat Trek. Random number generator; 2020. https://stattrek.com/statistics/random-number-generator.aspx. Accessed 22 February 2020.
47. Stat Trek. Sample size: stratified random samples; 2019. https://stattrek.com/sample-size/stratified-sample.aspx. Accessed 19 November 2019.
48. Prins A, Bovin MJ, Smolenski DJ, Marx BP, Kimerling R, Jenkins-Guarnieri MA, et al. The Primary Care PTSD Screen for DSM-5 (PC-PTSD-5): development and evaluation within a Veteran primary care sample. *J. Gen. Intern. Med.* 2016;31(10):1206–1211. https://doi.org/10.1007/s11606-016-3703-5.
49. Jia Z, Tian W, Liu W, Cao Y, Yan J, Shun Z. Are the elderly more vulnerable to psychological impact of natural disaster? A population-based survey of adult survivors of the 2008 Sichuan earthquake. *BMC Public Health.* 2010;10(172):1–12. https://doi.org/10.1186/1471-2458-10-172.
50. Carbone EG, Echols ET. Effects of optimism on recovery and mental health after a tornado outbreak. *Psychol Health.* 2017;32(5):530–548. https://doi.org/10.1080/08870446.2017.1283039.
51. Sharma S, Pathak A, Abbott JH, Jensen MP. Measurement properties of the Nepali version of the Connor Davidson resilience scales in individuals with chronic pain. Health Qual. *Life Outcomes.* 2018;16(56):1–11. https://doi.org/10.1186/s12955-018-0884-0.
52. Davidson JRT. Connor-Davidson Resilience Scale (CD-RISC) Manual. www.cd-risc.com; 2020. Accessed 1 January 2020.
53. Campbell-Sills L, Stein MB. Psychometric analysis and refinement of the Connor-Davidson Resilience Scale (CD-RISC): validation of a 10-item measure of resilience. *J. Trauma Stress.* 2007;20(6):1019–1028. https://doi.org/10.1002/jts.20271.
54. Wang L, Shi Z, Zhang Y, Zhange Z. Psychometric properties of the 10-item Connor-Davidson resilience scale in Chinese earthquake victims. *Psychiatry Clin. Neurosci.* 2010;64(5):499–504. https://doi.org/10.1111/j.1440-1819.2010.02130.x.
55. Tonsing K, Zimet GD, Tse S. Assessing social support among South Asians: the multidimensional scale of perceived social support. *Asian J Psychiatr.* 2012;5(2):164–168. https://doi.org/10.1016/j.ajp.2012.02.012.
56. Greenspace Mental Health. Perceived Social Support | MSPSS; 2020. https://help.greenspacehealth.com/article/92-perceived-social-support-mspss. Accessed 10 November 2020.
57. Zimet GD, Dahlem NW, Zimet SG, Farley GK. The multi-dimensional scale of perceived social support. *J. Pers. Assess.* 1988;52(1):30–41. https://doi.org/10.1207/s15327752jpa5201_2.
58. Perneger TV, Courvoisier DS, Hudelson PM. Gayet-Ageron A. sample size for pretests of questionnaires. *Qual. Life Res.* 2015;24(1):147–151. https://doi.org/10.1007/s11136-014-0752-2.
59. Government of Nepal, National Planning Commission Secretariat, & Central Bureau of Statistics. National population and housing census 2011: National report; 2012. https://unstats.un.org/unsd/. Accessed 10 November 2019.
60. Wagle S, Amnatsatsue K, Adhikari B, Kerdmongkol P, Van der Putten M, Silpasuwan P. *Health-Related Quality of Life After the 2015 Gorkha Earthquakes, Among Older Adults Living in Lalitpur District of Central Nepal.* Disaster Med Public Health Preps; 2020:1–10. https://doi.org/10.1017/dmp.2019.154.
61. Asian Development Bank. Country poverty analysis (detailed) Nepal; 2017. https://www.adb.org/sites/default/files/linked-documents/cps-nep-2013-2017-pa-detailed.pdf. Accessed 10 November 2020.
62. Sengupta U, Sharma S. Opinion: How will COVID-19 impact Nepal's earthquake-reconstruction efforts? 2020. https://www.devex.com/news/opinion-how-will-covid-19-impact-nepal-s-earthquake-reconstruction-efforts-97199. Accessed 10 December 2020.
63. Hansen R. Can Nepal cope with natural disasters and COVID-19 at the same time? 2020. https://travelbiznews.com/can-nepal-cope-with-natural-disasters-and-covid-19-at-the-same-time/. Accessed 10 November 2020.
64. The World Bank, The International Bank for reconstruction and development. promoting re-silience through post-crisis recovery; 2018. https://reliefweb.int/sites/reliefweb.int/files/resources/WRC3%20Proceedings%20and%20Knowledge%20Report%20FINAL.pdf. 10 November 2020.

65. International Bank for Reconstruction and Development/International Development Association. Resilient Recovery: an imperative for sustainable development, the way forward for strengthening recovery system and integrating disaster risk reduction into post-disaster recovery;2015. https://www.preventionweb.net/files/44171_resilientrecoveryanimperativeforsus.pdf. 10 November 2020.
66. Almazan JU, Cruz JP, Alamri MS, Alotaibi JSM, Albougami ASB, Gravoso R, et al. Predicting patterns of disaster-related resiliency among older adult Typhoon Haiyan survivors. *Geriatr Nurs*. 2018;39(6):629–634. https://doi.org/10.1016/j.gerinurse.2018.04.015.
67. Zhou H, Wang J, Wan J, Jia H. Resilience to natural hazards: a geographical perspective. *Nat. Hazards*. 2009;53:21–41. https://doi.org/10.1007/s11069-009-9407-y.
68. Hagedoorn M, Van Yperen NW, Coyne JC, van Jaarsveld CHM, Ranchor AV, van Sonderen E, Sanderman R. Does marriage protect older people from distress? the ole of equity and recency of bereavement. *Psychol Aging*. 2006;21(3):611–620. https://doi.org/10.1037/0882-7974.21.3.611.
69. Williams K, Umberson D. Marital status, marital transitions, and health: a gendered life course perspective. *J. Health Soc. Behav*. 2004;45(1):81–98. https://doi.org/10.1177/002214650404500106.
70. DePaulo B. Are single people mentally stronger? 2013. https://www.psychologytoday.com/au/blog/living-single/201305/are-single-people-mentally-stronger. Accessed 20 December 2020.
71. Hoffmann R, Blecha D. Education and disaster vulnerability in Southeast Asia: evidence and policy implications. *Sustainability*. 2020;12(1401):1–17. https://doi.org/10.3390/su12041401.
72. Cal SF, LRd Sá, Glustak ME, Santiago MB. Resilience in chronic diseases: a systematic review. *Cogent Psychol*. 2015;2:(1) 1024928. https://doi.org/10.1080/23311908.2015.1024928.
73. Malakar I, Chalise HN. Perception of elderly towards social security allowance in Nepal. *SAJSSE*. 2018;2(4):1–9. https://doi.org/10.9734/sajsse/2018/v2i430008.
74. Gurung LB, Paudel G, Yadav UN. Health service utilization by elderly population in urban Nepal: a cross-sectional study. *MMIHS*. 2016;2:27–36. https://doi.org/10.3126/jmmihs.v2i0.15794.
75. Jordans MJD, Luitel NP, Kohrt BA, Rathod SD, Garman EC, De Silva M, et al. Community-, facility-, and individual-level outcomes of a district mental healthcare plan in a low-resource setting in Nepal: a population-based evaluation. *PLoS Med*. 2019;16(2):e1002748. https://doi.org/10.1371/journal.pmed.1002748.
76. Hobfoll SE. The influence of culture, community, and the nested-self in the stress process: advancing conservation of resources theory. *J. Appl. Psychol*. 2001;50(3):337–421. https://doi.org/10.1111/1464-0597.00062.
77. Southwick SM, Sippel L, Krystal J, Charney D, Mayes L, Pietrzak R. Why are some individuals more resilient that others: the role of social support? *World Psychiatry*. 2016;15(1):77–79. https://doi.org/10.1002/wps.20282.
78. Cutter SL, Boruff BJ, Shirley WL. Social vulnerability to environmental hazards. *Soc. Sci. Q.* 2003;84(2):242–261. https://www.d.umn.edu/~pfarrell/Natural-%20Hazards/Readings/Cutter.%20Socail%20Vulnerability.pdf. Accessed 1 January 2020.
79. Byrne BM. *Structural Equation Modeling with Amos: Basics Concepts, Applications, and Programming*. 3 ed. Routledge Taylor & Francis Group; 2016.
80. Hair JF, Black WC, Babin BJ, Anderson RE. *Multivariate Data Analysis*. 8th ed. Cengage Learning, EMEA; 2019.
81. Azman AHN. Structural equation modeling (SEM): Confirmatory factor analysis (CFA). 2017. doi: 10.13140/RG.2.2.25615.38565.
82. Dixon JK. Exploratory factor analysis. In: Plichta S, Kelvin E, eds. *Munro's Statistical Methods for Health Care Research*. 6th ed. Wolters Kluwer/Lippincott, Williams and Wilkins; 2012:321–350.
83. Pallant J. *SPSS Survival Manual: A Step by Step Guide to Data Analysis using IBM SPSS*. 6th ed. McGraw Hill Education; 2016.