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Factors explaining resilience among Nepalese older adults experiencing disasters: A cross-sectional study

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ABSTRACT

Identification of protective factors of resilience among older adults experiencing disasters is essential to the promotion of a positive and successful psychosocial and spiritual adaptation to life adversities in the post-disaster phase. This cross-sectional analytical study was done to examine the factors explaining resilience among 303 randomly selected older adults experiencing disasters. Data were collected using the Socio-demographic, Personal, and Earthquake-related questions and another ten sets of standards and reliable instruments measuring explanatory and outcome variables. Descriptive and inferential statistics namely Pearson Product Moment Correlation were employed to analyze the data including path analysis for identifying the factors associated with resilience. The results reveal that the model shows a good fit with the empirical data that explained 75% of variance by self-efficacy, perceived stress, spirituality, self-esteem, and social support on resilience, and 47% of variance by self-esteem, social support, and perceived stress on self-efficacy. The strongest statistically significant factor explaining resilience was self-efficacy. Thus, resilience-focused interventions or services should be designed for public health practitioners, social workers, nurses, and other health professionals to enhance intrapersonal protective factors such as enhancing self-efficacy, creating a spiritual environment, alleviating perceived stress, and promoting self-esteem and social support which could foster older adults' survivors' resilience, both during and after disasters.

1. Introduction

Globally, in 2019, natural disasters affected millions of people, killed thousands of people [1], and influenced the global economy enormously [1,2]; the most affected were low- and lower-middle-income countries [1]. Likewise, these disasters are also a cause of devastating consequences on public health, politics, and the society at large [2]. Simultaneously, the geriatric population is increasing globally [3]. This population group is more vulnerable to the effects of disasters and they are often ignored in every phase of disasters [4], especially in the preparedness, as well as the immediate and long-term recovery phases of disasters which might influence their physical and psycho-emotional health and economy [4]. Although older adults are resourceful in the face of adversities in life [5], their needs, challenges, and abilities are often ignored during the response to disasters [6]. All of this stresses the necessity for robust public health promotion and prevention planning as well as interventions aimed at preparing older adults and the wider community to deal

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with the consequences of future disasters effectively [7]. However, this can only be possible after the careful identification of the resources and older adults' vulnerabilities to disasters. Evidence-based research can help identify relevant issues regarding the impact of disasters on older adults, and their recovery which might lead to valuable knowledge to inform policies and/or active measures geared toward disasters preparedness [8]. Therefore, this study focused on resilience among older adults exposed to disasters.

Resilience to a disaster denotes the individual's capability to recuperate and cope with the situation caused by the disaster and adjust to future adverse consequences [9]. It is dynamic and differs according to individual characteristics as well as one's culture, context, and severity of exposure to a particular trauma [10]. Resilience also helps promote success in adapting to, developing resistance to, and recovering from difficult life circumstances and events by utilizing one's own physical, psychosocial, and spiritual resources [11]. Evidence indicated that older adults are physically vulnerable to the negative impacts of disaster due to aging-related changes in physical functioning including low socioeconomic status [5]. However, older adults tend to have more psychological resources to handle difficulties post-disaster that may be more apparent in longer-term [5,12,13]. Thus, assessing resilience among older adults five years after an earthquake-related disaster has become greater attention.

In addition, much research on disaster mental health has focused on psychological distress and psychopathology [14] rather than positive psychological concepts such as resilience [4]. These scenarios were reflected by a systematic review and meta-analysis that highlighted post-traumatic stress disorder [PTSD], depression, anxiety disorders, adjustment disorder, and psychological distress [15] among disaster survivors. Furthermore, Gibson et al. [16] underscore that older adults affected by disasters are at a higher risk for long-term psychological distress. Thus, resilience, a psychobiological construct, can help protect from mental disorders in stressful situations, and there is the need to assess among vulnerable populations and contexts [17].

Moreover, multiple factors seem to be associated with resilience. Empirical evidence has shown that spirituality and attitudes towards sustainable development [12]; mental health and physical health [13]; social support, satisfaction with life [13,18]; self-esteem, optimism [19]; and general self-efficacy [20] were significant positive predictors of resilience in stressful situations among older adults. On the other hand, mistreatment [13] and loneliness [20] of older adults had significant negative relationships with resilience. In addition, a qualitative study among older adult survivors five years after Hurricane Katrina [21] revealed that transformative capacity, self-efficacy, mutual support, physical strength and health, optimism, and problem-solving ability were instrumental to their ability to cope with the situations that came their way after the disaster. Furthermore, other studies also showed that mental health [22] had a significant positive relationship with resilience, but perceived stress [23], and loneliness [24] had a significant negative relationship with resilience among different age-group populations along with adults who survived disasters. This evidence demonstrates some distinct factors associated with resilience according to age group.

Some socio-demographic variables such as age, gender, and marital status [13]; health problems, income [25]; and education [22] have been reported to exhibit a relationship with resilience in samples of young to older adults who survived a disaster. However, a systematic review [26] highlighted the scarcity of evidence related to a resilience-focused longitudinal study and factors associated with resilience in the long-term recovery phase after earthquake-related disasters among older adults. According to Southwick et al. resilience is a dynamic concept that might be influenced by age, maturity, specific challenges, resource availability, and the characteristics of an individual and/or the environment [27]. In addition, disaster recovery in terms of mental and behavioral health takes a long time, even years, which points to the necessity for long-term psychological support offered to disaster survivors [28]. Since various disasters can potentially impact an individual in his/her older life, the identification of the resilience status of older adults over time [9] and the bolstering of their resilience level are essential [9]. Studies have shown that the long-term recovery phase has been found to foster life in terms of rebuilding the disaster-affected area; managing the psychological, demographical, financial, and political issues associated with the disaster [29], preventing long-term negative effects [30], and developing a resilient community [29]. The long-term recovery phase depends on the severity of the disaster that starts at the end of the short-term recovery and lasts for one to 10 years or more [31]. In the information mentioned, the authors decided to examine the resilience-promoting factors among older adults surviving the 2015 Nepal earthquakes, especially in the long-term recovery phase, as these factors deal with various aspects of disaster impacts for the aged.

Nepal is the 11th most likely country in the world to experience earthquakes so it is conceivable to be exposed to the detrimental consequences of earthquakes in terms of both the economy and human life [32]. Globally, it is also in the top 20 of countries for multi-hazards [32]. Nepalese people experienced devastating earthquakes in 2015 [33] and were exposed to other subsequent natural disasters [34] that caused a great loss of life, destruction of property, physical and psychological injury, and trauma, and damage to homes. Nepalese communities are still under reconstruction after the 2015 earthquakes because of financial constraints [35], apathetic institutional organizations [34,35], political unsteadiness, lockdowns associated with the COVID-19 pandemic [34], weak governance, lack of adequate human resources, absence of local government institutions, and socio-cultural issues [36]. Consequently, many earthquake survivors are still living in temporary shelters [34].

The Help Age's Disaster Risk and Age Index (i.e., risks assessment through vulnerability and exposure, vulnerability and coping ability among older adults exposed to disaster in 190 countries) indicates that Nepalese older adults are relatively vulnerable to disasters [37]. Their vulnerability is related to (1) diminishing traditional social and family support, (2) the destruction of safety nets, (3) neglect and abandonment by family and community members, (4) breakdowns of social relationships, (5) lack of an integrated

economic recovery plan, (6) failure to consider their knowledge, skills, experiences related to disasters, (7) inability to use locally available resources, and (8) inequitable distribution of emergency relief operations and supports and allowances after earthquakes [38]. In addition, the vulnerability of older adults is associated with their poverty, dependency on others, lack of awareness on warning signs and evacuation notices and safety instructions, a decline in physical functioning, adjustment problems in the new environment, being homeless, and lack of electronic gadgets such as mobile phones for communication [7]. These vulnerable contexts might influence the resilience of Nepalese older adults exposed to disasters.

Currently, research is particularly limited among older adults when it comes to the long-term recovery phase of a disaster, especially earthquake-related disasters in both the local and global contexts. Thus, this study was designed to identify the factors explaining resilience in the long-term recovery phase among Nepalese older adults, who survived the 2015 earthquakes. Since disasters are expected to increase elsewhere, this study helps to awaken policymakers, health care workers, social workers, public health practitioners, and nurses to develop measures or plan intervention strategies for improving resilience in this population age group. In addition, this study would help stakeholders to prepare older adults to deal with disasters effectively, enhance their resilience level, and bolster their capacity to plan well for the future.

2. Conceptual framework of this study

The metatheory of resilience and resiliency [39] and the model of resilience for older adults [40], and causal model of resilience of Thai older adults [18] served as guiding references for the selection of explanatory factors. The identification of protective factors such as self-esteem, self-efficacy, and support systems is the first wave of resiliency inquiry. These protective factors, which are essential for adaptation to stressful life circumstances, may be external or internal [39]. The second wave of resiliency inquiry involves the process of adaptation to negative stressors in life by promoting protective factors of resilience. The identification and application of factors may enhance bio-psycho-spiritual homeostasis and increase the resilience characteristics useful for resilience. This process directs people to acquire wisdom, self-actualization, and altruism, and to be in a balanced condition [39]. Resnick [40], too, explored the resilience factors of older adults based on Richardson's metatheory of resilience and resiliency. These factors were self-reliance, spirituality, sense of purpose, humor, optimism, self-efficacy, self-esteem, and physical and mental health (i.e., internal protective factors) [40]. Likewise, social support, financial support, and natural environment were identified as external factors that promote resilience [40].

Perceived stress [23], loneliness [24], and satisfaction with life [13,18] were also selected as modifiable predictive variables of resilience based on prior evidence. Moreover, Hobfoll [41] highlighted that self-efficacy intervenes in the effects of optimism, self-esteem, and social support on resilience in a stressful situation. Furthermore, perceived stress had a negative relationship with self-efficacy among young to older adults [42). Thus, self-efficacy was used as the mediating variable in this study. This study was, therefore, aimed to 1) determine the fitness of the model of resilience, 2) analyze the positive effects of self-efficacy, self-esteem, optimism, mental health, life satisfaction, spirituality, and social support on resilience, 3) examine the negative effects of perceived stress on resilience, and (4) analyze the indirect and positive effects of self-esteem, optimism, and social support, and negative effects of perceived stress on resilience through self-efficacy in the long-term recovery phase among Nepalese older adults experiencing a disaster (see Fig. 1).

3. Methods

3.1. Design and settings

A cross-sectional path analytical research was conducted in Sindhupalchok District, which was selected using a cluster random sampling from the 14 districts of Nepal affected heavily by the 2015 earthquakes [43]. This district is one of the hilly regions of the country with 2542 Km² land territory [44], and is most prone to landslides due to the weakened landmass by the Nepal earthquakes in 2015 [45]. Thus, it has been influenced by the other subsequent natural disasters [45], as well as the impacts of earthquakes on the lives and economy of people living in this district [46]. The total population of the older adults in the district was 22,005. The proportion of the age and sex-wise distribution of the older adults of 65 years and older of this district were quite similar to those of all the 14 heavily 2015 earthquake-affected districts in Nepal [47]. People living in this district were reported as having poor living standards as well as experiencing difficulties in activities of daily living [44] with limited access to relief support due to geographic constraints related to landslides and information gaps [46].

3.2. Sample size and sampling

Three hundred and twenty-four samples were initially estimated based on the requirement of having 30 samples per explanatory variable (i.e., 270 for the nine modifiable variables) following the criteria by Nunally and Bernstein (1994) as cited by Norris [48], including the addition of 54 more respondents due to the possibility of a 20% non-response rate [49]. Cluster and stratified random sampling were used to select the settings and samples by the adoption of five steps (see Fig. 2). Step 1: Sindhupalchok District was

chosen by simple random sampling from 14 clusters of reported as grossly affected districts in Nepal due to the earthquakes of 2015. Step 2–3: An equal proportion of rural municipalities and municipalities in the district was randomly selected from the strata, respectively. Step 4: One city number from a municipality and one village number from each rural municipality were selected using a simple random sampling method. Step 5: Individual samples from the selected city number and village number of the selected municipality and rural municipalities, respectively were selected using a proportionate random selection method.

The authors selected those older adults who were 60 years and older based on Nepal Senior Citizens Act (2006) [50] at the time of earthquakes in 2015. Thus, the older adults who were aged over 65 and able to understand, had no communication barriers, could answer questions in the Nepali language, were residents of an earthquake-affected area, experienced the earthquakes in 2015, and voluntarily consented to participate were recruited in the study. Only one older adult was randomly selected from each household to ensure a representative sample with a greater diversity of experiences. Twenty-three selected older adults from the sampling frame were excluded because of refusal to take part (n = 9), communication problems (n = 8), refusal to complete the interview session (n = 4), psychiatric problems under the treatment (n = 1), and screened as having PTSD (n = 1) via the Primary Care PTSD Screen for DSM-5 (PC-PTSD-5) [51]. The primary author (PA)/research assistants chose the preceding random numbers from the sampling frame until achieving the required number of samples (i.e., 324) when the selected samples did not meet the inclusion criteria.

3.3. Instrumentation

Eleven instruments were used to collect the data and permission to use these instruments was obtained from all the authors. A panel of experts from Thailand and Nepal contributed to the content validation of these instruments focusing on the cross-cultural context. The average scale content validity index (SCVI/Ave) score of these instruments in the current study based on the experts' responses was >.90. Some instruments (1) Connor and Davidson Resilience Scale, (2) Multi-dimensional Scale of Perceived Social Support-Nepali Version, (3) Rosenberg Self-Esteem Scale, and (4) Satisfaction-with-Life Scale had already been translated into the Nepali language.

The General Self-Efficacy Scale, Positive Mental Health Scale, Life Orientation Test-Revised, Daily Spirituality Experiences Scale, Perceived Stress Scale, and Loneliness Scale were translated into Nepalese, back-translated into English, and adapted following the six steps guidelines of cultural and linguistic adaptation proposed by Borsa et al. [52]. Following suggestions of Perneger et al. [53], the pretesting of the Nepalese version of these instruments was conducted among 37 older adults of another district that had similar characteristics as those of the study population. The instruments are described as follows:

3.3.1. Explanatory variables

The authors developed socio-demographic, personal, and earthquake-related questions which comprised 25 items (see Table 1). The General Self-Efficacy Scale (GSE-10) [54] was used to assess elders' confidence and optimistic self-belief towards their coping ability with everyday hardship and all kinds of negative stressors in life. This is not a disaster-specific self-efficacy. Although self-efficacy is highly stable psychological trait-like qualities, it might be affected by traumatic events [55]. The GSE-10 was found valid among East German migrants [56] and reliable among Thai older adults [18]. Likewise, a well-translated, validated, and reliable Nepali version of the Multi-Dimensional Scale of Perceived Social Support-Nepali Version (MSPSS-N) [58] was used to assess social support. The MSPSS was developed by Zimet et al. [59] and consists of three subdomains (i.e., significant others, family, and friends). The MSPSS was found to be a reliable instrument among Nepalese earthquake survivors with spinal cord injury [60]. The Rosenberg Self-Esteem Scale (RSES) [62] was used to measure self-esteem among older adults which found to be a reliable instrument among disaster survivors [64]. A validated Positive Mental Health Scale (PMHS) [65] was used to assess mental health. A validated Life Orientation Test-Revised (LOTR-10) by Scheier et al. was used to assess optimism [66]. The LOTR-10 was found to be a reliable instrument among Thai older adults suffering from chronic diseases [18].

In addition, the Daily Spirituality Experiences Scale (DSES) [68] was used to assess spirituality. The inter-rater reliability, internal consistency reliability, and test-retest reliability of the DSES were established by Underwood and Teresi [68]. The Perceived Stress Scale (PSS) [70] was used to measure stress levels. A previous study confirmed the construct validity of PSS among Korean older adults [72], and another study confirmed its reliability among Thai older adults [18]. A reliable and valid Loneliness Scale [73] was used to measure social and relational connectedness as well as self-perceived isolation. The Satisfaction-with-Life Scale (SWLS) [75] was used to measure life satisfaction. The SWLS has been shown to have favorable psychometric properties, i.e., high internal consistency and temporal reliability [75]. Furthermore, the SWLS was found to be reliable among Thai older adults [18].

3.3.2. Outcome variable

Connor and Davison Resilience Scale (CD-RISC-10) [77] was used to measure resilience. Sharma et al. [78] demonstrated the validity and reliability of the CD-RISC-10 among a Nepalese adult population experiencing chronic pain. The construct validity of the CD-RISC-10 was confirmed among Chinese earthquake survivors [80]. In addition, this tool was reliable among people experiencing a disaster [22,23,80]. The authors have presented the details of each instrument in Table 1.

3.4. Data collection procedure

Five research assistants [RAs] and one local interpreter were recruited. All of them had at least a diploma-level education, were experienced in data collection in the community, and lived in the study settings. Such attention was devoted to the recruitment criteria in order to ensure ample access to and acceptance by the community during this pandemic situation along with considerations in regards to transportation difficulties and in accordance with the recommendations of the administrative authorities of the study settings. The five RAs and the local interpreter were trained using video clips, data collection guidelines, a checklist with tips for effective communication practices, and interview schedules. Additionally, face-to-face discussions with the RAs regarding ethics and data collection procedures, as well as demonstrations and return demonstrations of the interviewing procedures were done in order to ensure their ability to obtain accurate data. Each interview lasted from 45 to 60 min at the respondents' respective homes. Field and central data editing were completed in order to identify any missing and/or incorrect information collected during the interviews.

3.5. Data analysis

Descriptive and inferential data analysis was done using the SPSS Statistics for Windows, version 16.0 (SPSS Inc., Chicago, Ill., USA) after data validation and cleaning using the Epi Data software. Additionally, Confirm IBM SPSS Analysis of Moment of Structures [AMOS] version 21 software (AMOS Development Corporation, USA) was employed for testing model fit and showing the path diagram. No missing data were found prior to analysis because of intensive field editing of interview schedules after each interview. After assessing the multivariate outliers using Cook's distance, 21 samples were removed. Thus, further analysis was done with 303 (93.52%) samples. Harman's single-factor test revealed that the data of the current study did not suffer from the common method bias characteristic of a single method of data collection. Assumptions of regression analysis and path analysis were met (see Table 5). Though diagnostic indicators of multicollinearity among variables were within the reference range, the problems with multicollinearity issues were found. In addition, there was no statistically significant relationship between mental health and resilience although a correlation of mental health variable with other explanatory variables had high VIF (i.e., 2.742 [close to 3), Condition Index (CI) > 10, and variance proportion (i.e., 0.75 [close to 0.8]). Thus, the mental health variable was deleted following the second step of dealing with multicollinearity issues as recommended by the relevant literature [81]. Thus, the path analysis was done to examine the strength and direction of the relationship of eight explanatory variables, (i.e., self-efficacy, self-esteem, optimism, life satisfaction, perceived stress, loneliness, spirituality, and social support) with resilience.

Next, the model was assessed for its goodness of fit through model estimation with Generalized Least Squares, evaluation of model fit with Absolute Fit Indices [*AFI*] and Incremental Fit Indices [*IFI*] (see Table 5), and interpretation of path analysis. Additionally, a 95% bias-corrected confidence interval was employed to identify the significance of indirect and total effects of the variables through a mediator with 1000 bootstrapping resamples. The significant relationship between explanatory and outcome variables was considered based on a 5% level of significance.

3.6. Ethical considerations

The authors received ethical clearance from the Nepal Health Research Council, Nepal (Ref. No. 2114), and the Center for Social and Behavioral Sciences Institutional Review Board (CSBSIRB), Faculty of Nursing, Prince of Songkla University (PSU), Thailand (Document No. 2020NS: Qn005). In addition, the PA obtained permission from the administrative authorities of the selected study settings in Nepal. Written informed consent was obtained from either the literate older adults or the family members of the illiterate older adults (who could not read and write) after receiving their verbal consent. The other ethical considerations related to the respondents such as anonymity, privacy, confidentiality, beneficence, and justice were faithfully adhered to during the data collection and publication process along with the social ethics procedures for the prevention and control of COVID-19 infection.

4. Results

4.1. Socio-demographic information of respondents

As shown in Table 2, 303 respondents participated in this study; their mean age was 74.11 ($SD \pm 6.71$) years. More than half of them were female (54.5%), married (52.1%), lived in joint families (50.2%), and had difficulties performing activities of daily living (ADLs). Moreover, the majority were Hindu (83.5%), illiterate (79.9%), had current health problems (91.4%), and had regular personal income (30.7%).

4.2. Descriptive analysis of study variables

Half (50.5%) of respondents had an intermediate level of resilience whereas nearly half of them had equally high (47.2%) and low (45.5%) levels of self-efficacy. Likewise, the greatest proportion of respondents had high levels of social support (60.7%) and perceived stress (77.6%), normal (neither low nor high) level of self-esteem (62.4%), and a moderate level of optimism (42.5%). The highest proportion of respondents had a low level of mental health (47.5%) and spirituality (49.7%). More than half of respondents did not perceive being lonely (51.2%) and were satisfied with their life (72.6%) (Table 3).

4.3. Correlations between explanatory variables and resilience

The finding revealed a statistically significant negative relationship of perceived stress, and loneliness, with resilience. In addition, a significant positive relationship of self-efficacy, social support, self-esteem, mental health, optimism, spirituality, and life satisfaction, with resilience was evident. The correlation among the explanatory variables lies between -.14 and .83 (Table 4).

4.4. Model of and factors explaining resilience

The test results of *AFI*, and *IFI* for the model fit of the hypothesized model revealed that the model fitted with the empirical data ($\chi^2 = 2.73 \ [p = .435]$), χ^2 : df = 0.91, *GFI* = 0.998, Adjusted Goodness of fit index (*AGFI*) = 0.970, Root Mean Square Error of Approximation (*RMSEA*) = 0.000 [0.000, 0.094], Standardized Root Mean Square Residual (*SRMR*) = 0.010, Comparative Fit Index (*CFI*) = 1.000, Normed Fit Index (*NFI*) = 0.992, and Non-Normed Fit Index (*NNFI*) = 1.011) (Table 5).

The result also showed that self-efficacy ($\beta = 0.62, p = .001$), and spirituality ($\beta = 0.08, p = .018$) had significant direct and positive effects on resilience. In addition, perceived stress had a significant direct and negative effect ($\beta = -0.23$, p = .002) on resilience. However, self-esteem, optimism, life satisfaction, social support, and loneliness did not have a significant direct effect on resilience (see Table 6 and Fig. 3). 3). In addition, there was a significant indirect and positive effect of self-esteem on resilience through self-efficacy $(\beta = 0.22, p = .002, CI = [0.141, 0.299])$, and a significant total effect of the paths from self-esteem to resilience, self-esteem to selfefficacy, and self-efficacy to resilience ($\beta = 0.29$, p = .002, CI = [0.181, 0.401]). Likewise, the findings show the significant indirect and positive effect of social support on resilience through self-efficacy ($\beta = 0.09$, p = .005, CI = [0.031, 0.146]) with the non-significant total effects of the paths from social support to resilience, social support to self-efficacy, and self-efficacy to resilience ($\beta = 0.03$, p =.604, CI = [-0.071, 0.125]). Furthermore, the model demonstrated the significant mediating effects of self-efficacy between self-esteem and resilience and social support and resilience by the bias-corrected 95% bootstrap CI (Table 6 and Fig. 3). On the other hand, the model presented the non-significant indirect effect of optimism on resilience through self-efficacy, and the non-significant total effects of the paths from optimism to resilience, optimism to self-efficacy, and self-efficacy to resilience (Table 6 and Fig. 3). Consequently, self-efficacy, perceived stress, spirituality, self-esteem, and social support explained 75% of the variance on resilience ($R^2 = 0.75$). Furthermore, perceived stress, self-esteem, and social support except optimism had a significant direct effect on self-efficacy. Perceived stress, self-esteem, and social support accounted for 47% of variances on self-efficacy ($R^2 = 0.47$) (Fig. 3). Therefore, the model with six significant and some non-significant paths was proved to be a well-fitted model with the empirical data (Fig. 3).

5. Discussion

The majority of respondents belonged to the 65–74-year age group, and a slightly higher proportion was female. In addition, nearly half of the respondents lived in nuclear families, even though they had children. In this study, the Hindu religion was predominant, and more than two-thirds (69%) of respondents had no regular personal income that accounted for low rates of occupational and retirement pension facilities [85]. Similar to a recent study in an urban setting revealed that only 9% of older adults were receiving retirement pensions [86], and 17.4% of Nepalese people are under multidimensional poverty [87]. Thus, the regular personal income of older adults could help meet their daily needs and facilitate disaster preparedness activities.

Most respondents in this study reported having an intermediate level of resilience. Concerning the model of resilience, the hypothesized model achieved the model fit criteria among older adults aged 65–99 years, with the direct effect of self-efficacy, spirituality, and perceived stress on resilience. The current model is different from the causal model of the resilience of Thai older adults developed by Toonsiri et al. [18] regarding some explanatory variables, study sample characteristics, and the Resilience Scale they used. Toonsiri et al. [18] revealed the goodness of fit statistics with the direct effects of optimism, life satisfaction, social support, and wellbeing on resilience, and the indirect effects of optimism, self-efficacy, and social support through wellbeing on resilience. The different results might be related to study context, sample characteristics, geographical variability, and the instruments used for measuring resilience among older adults. Additionally, the findings of this study supported the statements of Southwick et al. [27] in that resilience might vary depending on age, specific challenges, environmental context, and nature of trauma/stress. Zhou et al. [88] also stated that the socio-economic and environment-related factors of the regions and localities, nature and time of emergency responses, relief efforts, and the recovery measurement of the disaster victims might affect the resilience.

The relationship between self-efficacy and resilience in the current study is found. This is supported by Arnold [89] who mentioned that self-efficacy motivates Nepalese older adults to establish self-sustainable activities (such as farming and marketing), support other community members with their self-confidence, and prepare to deal with the hardships associated with recent and future hazards. Additionally, self-efficacious older adults often perceive that their problems associated with a disaster are similar to others in the community, the nation, and the world [89]. In addition, the study finding is also congruent with the meta-theory of resilience and resiliency [39], the model of resilience [40], and the previous study among older adults five years after Hurricane Katrina [21]. Similarly, Newnham et al. [90] also emphasized that people having high self-efficacy were motivated to prepare for future disasters, made earlier decisions for evacuation during the warning phase of a disaster, and believed that their efforts brought effective action [90]. In addition, people with self-efficacious behaviors perceive environmental intimidations as opportunities, are motivated to

achieve the desired goals, challenge the situation through proactive control, put extra effort into establishing challenging goals, and mobilize efforts to achieve what they need [91]. Therefore, the above explanations offer valid reasons that self-efficacy appeared as a substantial predictor of resilience among Nepalese older adults experiencing earthquake-related disasters.

The present study also proved the significant relationship between spirituality and resilience. This is a unique finding as compared to the model of resilience by Toonsiri et al. [18]. Spirituality is essential to decrease vulnerability and trauma related to a disaster and enhance the health and self-worth of older adults [12]. The result of the present study has enhanced a metatheory of resilience and resiliency [39], and the model of resilience of older adults [40] which highlighted that spirituality promotes resilience in the face of adversity. Moreover, the commitment of older people to spiritual practice, reliance on relationships, spiritual coping, transformation, and the power of beliefs facilitate coping with adverse life experiences and promote resilience [92]. In the Nepalese context, spirituality is central to the people and society [93] in terms of linking their spirituality with God, supernatural powers, and people's moral behaviors [93]. They believe that God will take away their problems and bad fortune [93]. Thus, it might support a direct and positive effect of spirituality on resilience among Nepalese older adults exposed to earthquake-related disasters.

The current study demonstrated the significant relationship between perceived stress and resilience, which is congruent with the previous study [27]. Thapa et al. [94] showed that poor health status, exposure to adverse life events, inability to work on the land, chronic health problems, diminished social support, and social activities as the factors related to perceived stress among Nepalese older adults. These scenarios indicated the foremost reasons that perceived stress was the significant negative explanatory factor of resilience.

This study also shows the mediating effect of self-efficacy between self-esteem and resilience, and social support and resilience that are congruent with the finding of the COR theory of Hobfoll [41]. People having high social support have faith that they can get the required support and assistance during difficult times or setbacks. Thus, people's confidence in problem-solving is enhanced by their available social support, which indicates their strong self-efficacy [95]. Nepalese older adults who received support from family, friends, or someone close to them after earthquakes had more coping capacity [38]. Thus, older adults who receive social support might perceive that there is someone to help and support them in hard times. So, they are confident and capable to handle and deal with difficult circumstances. Likewise, Janoff-Bulman mentioned that people's self-esteem might be low for 10 or 15 years or even longer after experiencing catastrophes as cited in Goleman [96]. People with high self-esteem foster disaster preparedness [97]. Thus, this might be the cause of the relationship between self-esteem and self-efficacy.

This study also reveals that self-efficacy mediates the relationship between perceived stress and resilience, which is consistent with the former studies as "the higher the stress level was", the "lower self-efficacy was" [42]. None of the other former studies highlighted the mediating effects of self-esteem, social support, and perceived stress on resilience via self-efficacy. Additionally, the model of resilience had six non-significant direct paths from self-esteem, social support, optimism, life satisfaction, and loneliness with resilience, and indirect paths from optimism to resilience through self-efficacy. Despite having the non-significant paths in the model, the authors did not delete the non-significant paths following the recommendations in the literature [98].

The authors have highlighted the strengths of this study by using cluster and stratified random sampling with a precise sample size that ensured an adequate representative sample of the heavily affected district by the 2015 earthquakes. Therefore, the findings could be generalizable to other older adults residing in other municipalities and rural municipalities of districts where experiencing earthquake-related disasters. Furthermore, this study employed standard, valid, and reliable instruments. However, some limitations need to be pointed out. Generalization to other districts where having distinct socio-economic statuses and geographical variability should be carefully considered. This cross-sectional survey was conducted five years after the 2015 Nepal earthquakes focusing on the long-term recovery phase. The retrospective nature of the study and the lack of pre-disaster findings on the factors explaining resilience among the older adults did not capture the baseline resilience, the dynamic nature of resilience, and the explaining factors of resilience in the pre-, during, and post-recovery phases. Therefore, this study may suffer from temporal ambiguity regarding the cause-and-effect relationship of the factors involved. In addition, the self-report technique to gather information on resilience was used that may have limited its ability in identifying the actual level of resilience and its explaining factors among older adult disaster survivors. Furthermore, the study findings do not reflect the predictors of resilience among Nepalese older adults in a different time period. Therefore, longitudinal follow-up studies with multiple data collection techniques and control groups might overcome these limitations.

6. Conclusions and implications

The causal model of resilience of this study fitted with the empirical data among older adults experiencing earthquake-related disasters in Nepal. Additionally, this study highlights that self-efficacy had the strongest significant direct positive effect on resilience followed by spirituality, as well as the negative effect of perceived stress. In addition, self-esteem, social support, and perceived stress through self-efficacy played important effects on resilience in the long-term recovery phase. Thus, these findings could be useful to nurses, mental health professionals, social workers, public health practitioners, researchers, and policymakers in developing and implementing resilience-promotion intervention programs by various strategies, i.e., promoting self-efficacy, self-esteem, and social support; lessening the perceived stress level, and ensuring an appropriate spiritual environment by enhancing the power of spiritual

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beliefs in older adults experiencing disasters.

Future studies need a robust methodology and longitudinal prospective study design to address the direct and indirect relationships of these selected variables with disaster-related resilience in the long term. Moreover, testing the study model may strengthen and expand its generalizability. Although social support has been found to be a strong and significant external protective factor that promotes resilience in numerous previous studies, it showed no predictive relationship with resilience among this study's population. However, it had an indirect effect on resilience through self-efficacy. Thus, this study suggested conducting an interventional study in the future for testing the implications of enhancing social support to increase self-efficacy among older adults exposed to a disaster that, in turn, may elicit positive impacts on resilience. In addition, further qualitative research is warranted in order to explore the pattern of social support and socio-cultural context of support among Nepalese older adults and their resilience to disasters.

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Authors' contributions

All authors met the authorship criteria and were involved in (1) the conception of the original research idea and study design: RT, PS, & WS; (2) data collection: RT; (3) data analysis and synthesis: RT, PS, & WS; (4) drafting, revising, and finalizing the manuscript: RT, PS, & WS; and (5) acknowledge their responsibility for all the aspects of the work and the final manuscript: RT, PS, & WS.

Declaration of competing interest

The authors declare that they have no known competing financial interests or personal relationships that could have appeared to influence the work reported in this paper.

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Appendix



Fig. 1. A Hypothesized Causal Model of Resilience Among Nepalese Older Adults Experiencing Disaster...



Fig. 2. Cluster and stratified random sampling used in this study..

Table 1

Description of Instruments Used in this Study

Name of Instruments/Example of Items	Number of Items	Response Format	Ranged of Total Scores & α of this Study	
 Socio-demographic, personal, and earthquake-related questions Age, sex, religion, marital status, type of family Literacy status (i.e., measured as literate: can read and write, and had formal or informal education, and illiterate: cannot read and write, and did not have any formal and informal education) Current health problems (at least one current health problems: present [yes]/absent [No]) Problems in performing ADLs, and regular personal income. 	25	Yes/No	_	
 General Self-efficacy Scale (GSE-10) [54] "Thanks to my resourcefulness, I know how to handle unforeseen situations." 	10	4-point rating scales: Not at All True (1) to Exactly True (4)	$10-40$ $\alpha = .92$	
 Multi-dimensional Scale of Perceived Social Support- Nepali Version (MSPSS-N) [58,59] "I have a special person who is a real source of comfort to me." 	12	7-point Likert scale: Very Strongly Disagree (1) to Very Strongly Agree (7)	$\begin{array}{l} 1284\\ \alpha=.92 \end{array}$	
4. Rosenberg Self-esteem Scale (RSES) [62] "I feel I do not have much to be proud of."	10 (Equally Half [i.e., 5] items Positively and Negatively Worded) [62]	4-point Likert scale—Strongly Disagree (0) to Strongly Agree (3)	$\begin{array}{l} 0-30\\ \alpha=.75 \end{array}$	
5. Positive Mental Health Scale (PMHS) [65] "Much of what I do brings me joy."	9	4-point Likert Scale: Do Not Agree (0) to Agree (3)	$\begin{array}{l} 0-27\\ lpha=.90 \end{array}$	
6. Life Orientation Test-Revised (LOTR-10) [66] "I'm always optimistic about my future."	10 (Out of 10, 3: Positively Worded 3: Negatively Worded 4: Filler statements) [66]	5-point Rating Scale: Strongly Disagree (0) to Strongly Agree (4)	0-24 Excluding Filler Items $\alpha = .73$	
 Daily Spirituality Experiences Scale (DSES) [68] "I desire to be closer to God or in union with the divine." "How close do you feel to God (or the divine)?" 	16	6-point Likert Responses: Never (1), Once in a While (2), Some Days (3), Most Days (4), Every Day (5), and Many Times a Day (6) 4 possible responses for 1 item: 1 (Not Close), 3 (Somewhat Close), 5 (Very Close), and 6 (As Close as Possible)	16–96 α = .89	
8. Perceived Stress Scale (PSS) [70] "How often have you been upset because of something that	10 (Out of 10, 4: Positively Worded Statements)	5-point Likert Scale: 0 (Never) to 4 (Very Often)	0-40 lpha = .85	
9. Loneliness Scale [73] "How offen do you feel isolated from others?"	3	3 Response Categories: 1 (hardly ever) to 3	3-9	
10. Satisfaction-with-Life Scale (SWLS) [75] "So far, I have gotten the important things I want in life."	5	7-point Likert Scale: 7 (strongly agree) to 1 (strongly disagree)	$\alpha = .02$ 5–35 $\alpha = .81$	
 11. Connor and Davison Resilience Scale (CD-RISC-10) [77] "I try to see the humorous side of things when I am faced with problems." 	10	5-point Rating Reponses: 0 (Not True at All) to 4 (True Nearly at All the Time)	$\begin{array}{l} 0-40\\ \alpha=.89 \end{array}$	

Table 2

Respondents' socio-demographic characteristics. N = 303

Variables	Frequency	Percentage
Age in years ($x^- = 74.11$, $SD \pm 6.71$)		
65-74	177	58.4
75-84	105	34.7
85 and above	21	6.9
Sex		
Female	165	54.5
Male	138	45.5
Religion		
Hindu	253	83.5
Buddhist	28	9.2
Christian	22	7.3
Marital status		
Married	158	52.1
Widowed/separated/divorced/unmarried	145	47.9
Type of family		
Nuclear	140	46.2
Joint	152	50.2
	(

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Variables	Frequency	Percentage
Extended	11	3.6
Literacy status		
Illiterate	242	79.9
Literate	61	20.1
Current health problems		
Yes	277	91.4
No	26	8.6
Problems performing ADLs		
Yes	162	53.5
No	141	46.5
Current regular personal income		
Yes	93	30.7
No	210	69.3

Table 3

Descriptive analysis of the respondents' resilience, self-efficacy, social support, self-esteem, mental health, optimism, spirituality, perceived stress, loneliness, and life satisfaction. N = 303

Variables	Range	Median (Md)	IQR	М	SD	Level (%) ^a
Resilience	0–40	20	12.00	20.10	8.40	Intermediate (50.5) ^b
Self-efficacy	10-40	26	10.00	25.56	7.61	Nearly equally high (47.2)/low (45.5) ^c
Social support	12-84	64	17.00	59.17	16.43	High (60.7) ^d
Self-esteem	6–30	17	6.00	17.87	4.42	Normal (62.4) ^e
Mental health	2–27	21	8.00	19.73	5.72	Low (47.5) ^f
Optimism	4–24	15	5.00	15.55	3.87	Moderate (42.6) ^g
Spirituality	17–96	70	22.00	66.71	16.29	Low (49.5) ^h
Perceived stress	0–36	18	7.00	16.94	7.08	High (77.6) ⁱ
Loneliness	3–9	5	4.00	5.43	2.11	Not lonely (51.2) ^j
Life satisfaction	5–35	27	6.00	25.76	6.20	Satisfied (72.6) ^k

Note.

^a The highest proportions of respondents represent this level. Categorization of Level of.

^b Resilience: 1st quartile = low resilience, 2nd and 3rd quartiles = intermediate level of resilience, and 4th quartile = highest level of resilience [79].

^c Self-efficacy = Based on the median cutoff point of the current samples [57].

^d Perceived social support: 12–35 (low perceived support), 36–60 (medium perceived support), and 61–84 (high perceived support) [61].

^e Self-esteem: 0–15 (low self-esteem), 15–25 (normal self-esteem), and 25–30 (high self-esteem) [63].

^f The higher the scores were, the better the mental health condition was, so level of mental health was based on median value [65].

^g Optimism: Low optimism (0–13), moderate optimism (14–18), and high optimism (19–24) [67].

^h Spirituality: Low level (total scores below median value), medium level (median value scores), and high level (scores higher than median value) [69].

ⁱ Based on the norm table for the PSS-10 item for the older adults 65 years and older, the cut-off points for differentiating people with a greater perceived stress level was mean (M) = 12 $(SD \pm 6.3)$ [71].

^j 3–5: Not lonely, 6–9: Lonely [74].

^k Highly satisfied (30–35), satisfied (25–29), average satisfied (20–24), slightly satisfied (15–19), dissatisfied (10–14), and extremely dissatisfied (5–9) [76].

Table 4

Correlations between explanatory variables and resilience (N = 303)

Variables	1	2	3	4	5	6	7	8	9	10
1. Self-efficacy	1.00									
2. Social Support	.29**	1.00								
3. Self-esteem	.60**	.25**	1.00							
4. Mental Health	.58**	.61**	.48**	1.00						
5. Optimism	.48**	.22**	.60**	.35**	1.00					
6. Spirituality	.34**	.36**	.37**	.32**	.23**	1.00				
7. Perceived Stress	55**	14*	52**	40**	45**	32**	1.00			
8. Loneliness	31**	20**	29**	17**	18**	29**	.47**	1.00		
9. Life Satisfaction	.43**	.62**	.42**	.68**	.22**	.45**	43**	31**	1.00	
10. Resilience	.83**	.24**	.61**	.55**	.48**	.40**	65**	32**	.45**	1.00

Note. **: *p* < .01. *: *p* < .05.

Table 5

Model Fit Statistics of the Hypothesized Model After Deleting Mental Health Variable

Statistical Test	Final Modified Model ^a	Reference Criteria of Goodness of Fit Value		
Absolute Fit Indices				
Chi-Square	2.73 (p = .435)	>.05 [82]		
Normed Chi-Square (χ^2 : df ratio)	2.73/3 (.91)	3:1 [82]		
GFI	.998	>0.90 [82]		
AGFI	.970	≥0.90 [83]		
SRMR	.010	≤.05 [84]		
RMSEA [95% CI], PCLOSE	.000 [.000, .094], .703	<.05 to .08 [84]		

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Table 5 (continued)

Statistical Test	Final Modified Model ^a	Reference Criteria of Goodness of Fit Value
Incremental Fit Indices		
CFI	1.000	>.95 [superior fit] [82]
NFI	.992	>.95 [superior fit] [82]
NNFI [TLI]	1.011	.9 or .95 [82]

Note. Achieved assumptions of regression analysis: (1) normal distribution of data based on absolute skew value (i.e., <2) and an absolute kurtosis (i. e., <7) without considering the z-values; (2) homoscedasticity based on scatter plot of the standardized residuals; (3) bivariate and multivariate linearity based on scatter plots and Normal P-P Plot of Regression Standardized Residual; (4) non-multicollinearity based on (a) Pearson productmoment correlation [r = -0.142 to 0.825] (see Table 4), (b) tolerance value [0.365 to 0.721], (c) variation inflation factor (VIF) [1.387 to 2.742], and (d) variance proportions [<0.8], and (5) autocorrelation (i.e., Durbin Watson value = 1.96).

Diagnostic Indicators of Multicollinearity: Correlation value (r) \geq 0.90; Tolerance values close to zero (a suggested cut point is .10 or less); VIF \leq 3; and variance proportion parallel to a common CI higher than 10 to 30, are higher than 0.8 to 0.9 of the all explanatory variables.

Achieved assumptions of path analysis: Level of measurement of variables (i.e., interval level of measurement), recursive model (i.e., unidirectional relationship), made efforts for minimizing the measurement errors by using reliable and valid instruments and specification error using the meta-theory of resilience and resiliency and findings of other empirical investigations for developing the hypothesized model), and using the overidentified model.

GFI: Goodness of Fit Index, AGFI: Adjusted Goodness of fit index, RMR: Root Mean Square Residual SRMR: Standardized Root Mean Square Residual. RMSEA: Root Mean Square Error of Approximation. CFI: Comparative Fit Index. NFI: Normed Fit Index. NNFI: Non-Normed Fit Index. TLI: Tucker-Lewis Fit Index.



Fig. 3. Model of Resilience Among Older Adults Experiencing D	isas
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Table 6

Direct, Indirect, and Total Effects of the Modified Model

Paths	Paths Direct effects		Indire	Indirect effects			Total effects			
	β	р	95% bias-corrected bootstrap CI	β	р	95% bias-corrected bootstrap CI	β	р	95% bias-corrected bootstrap <i>CI</i>	-
$\text{SEF} \rightarrow \text{RESIL}$.62	.001**	[.543, .691]	-	-	-	_	-	-	
$SS \rightarrow RESIL$	06	.088	[143, .010]	_	-	-	_	-	-	
$SS \rightarrow SEF$.14	.006**	[.049, .233]				-	-	_	
$SS \rightarrow SEF \rightarrow$	_	_	_	.09	.005**	[.031, .146]	.03	.604	[071, .125]	
RESIL										
$SES \rightarrow RESIL$.07	.060	[007, .155]	_	-	_	_	-	-	
$SES \rightarrow SEF$.35	.002**	[.229, .486]	_	-	-	_	-	-	
SES \rightarrow SEF \rightarrow	_			.22	.002**	[.141, .299]	.29	.002**	[.181, .401]	
RESIL										
$OPT \rightarrow RESIL$.03	.443	[045, .093]	_	-	_	_	-	-	
$OPT \rightarrow SEF$.10	.106	[023, .204]				_	_	-	
$OPT \rightarrow SEF \rightarrow$	_	_	_	.06	.105	[013, .131]	.09	.095	[017, .184]	
RESIL.						- , -			- , -	

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Table 6 (continued)

Paths Direct effects			Indirect effects			Total effects			
	β	р	95% bias-corrected bootstrap CI	β	р	95% bias-corrected bootstrap CI	β	р	95% bias-corrected bootstrap <i>CI</i>
$\text{SPIR} \rightarrow \text{RESIL}$.08	.018*	[.011, .158]	_	_	-	_	-	-
$PSS \rightarrow RESIL$	23	.002**	[307,399]	-	-	_	-	-	_
$PSS \rightarrow SEF$	31	.003**	[399,194]				-	-	_
$\mathrm{PSS} \to \mathrm{SEF} \to$	-	-	_	19	.002**	[249,120]	42	.002**	[518,322]
RESIL ^a									
$\text{LONELI} \rightarrow \text{RESIL}$.04	.328	[037, .110]	-	-	_	-	-	_
$\text{SWL} \rightarrow \text{RESIL}$.06	.140	[021, .145]	-	-	-	-	-	-

Note. Mental health variable was deleted. *: $p \le .05$. **: p < .01. RESIL = Resilience. SEF: Self-efficacy. SS: Social Support. SES: Self-esteem. OPT: Optimism. SPIR: Spirituality. PSS: Perceived Stress. LONELI: Loneliness. SWL: Satisfaction with Life. *CI*: Confidence Interval.

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