Sustainability of Knowledge and practice regarding disasters among people living in flood-prone areas of Nepal

Bidur Bastola
CARE Nepal
Email: bidbas@gmail.com

Swechchha Shrestha
CARE Nepal
Email: Swechchhas3@gamil.com

Abstract: The main objective of this study is to examine the sustainability of knowledge and practice regarding disasters among people living in flood-prone areas of Nepal. Data for this survey were collected through a cross-sectional research design using a quantitative method. CARE Nepal and Handicap International implemented a community-based disaster risk reduction VISTAR project in Nepal's Kailali, Dadeldhura, Kanchanpur, and Dang districts. The study used the baseline, end-line, and mainly post-project sustainability (PPS) survey data for detailed analysis. The study was conducted in four rural municipalities/municipalities of the Sudurpashchim Province. Univariate, Bivariate, and multivariate analyses (binary logistic regression) were applied to examine the sustainability of knowledge and practice regarding disasters among people living in flood-prone areas of Nepal.

It was observed that slightly over two-thirds of the respondents (67.5%) were female, while nearly one-third (32.5%) of them were male. More than one-fourth (27.5%) of the respondents were from the 25-34 age group, followed by one-fourth (25.1%) from the 35-44 age group. Knowledge of various types of disasters had increased for all types in the end-line (24.5 in the baseline to 32.9 in the end line) and showed sustainability in the PPS study (44.08) on average. Only less than a fourth (24%) of respondents reported the Household (HH) level plan requirement to mitigate the effect of disaster. Multivariate analysis found that respondents whose caste/ethnicity was Dalit (aOR= 1.3, 95% CI=0.7-2.23) and Janjati (aOR= 1.37, 95% CI=0.7 – 2.67) were more likely to know about the requirement of the HH level plan to mitigate the effect of a disaster than Brahmin/Chettri. Likewise, respondents whose primary source of income was small business/service were 3 times (aOR= 3.58, 95% CI= 1.46- 8.81) more likely to know about the requirement of the HH level plan to, mitigate the effect of a disaster than those whose source of income was agriculture. Knowledge of the type of disaster and the need for a household-level plan to mitigate disaster is very low. Thus, programs that advocate the importance of following disaster mitigation measures at the community and household level should be targeted to motivate people to be self-equipped to tackle possible disaster incidents.

Keywords: Disaster, Sustainability, Household level Plan, Disaster Mitigation, Flood Prone Area

Introduction

Nepal is among the 20 most disaster-prone countries in the world, affected by multiple recurrent hazards due to high relief and harsh topography with steep slopes, significant seismicity, and highly concentrated monsoon rains (Nepal et al., 2018). Every year, the country suffers from a significant loss of human lives and property damage due to natural and non-

natural disasters/human-induced hazards such as floods, landslides, soil erosion, fire, road accidents, and epidemics every year. Meanwhile, more than 80 percent of the total population of Nepal is at risk from natural hazards, such as floods, landslides, windstorms, hailstorms, fires, earthquakes, and glacial lake outburst floods. Besides these, increasing population, poverty, unplanned urban settlements, and lack of risk-informed development activities have further increased disaster vulnerabilities (NPDRR, 2018).

Nepal ranks fourth, eleventh, and thirteenth most vulnerable to climate change-induced risks, earthquakes, and floods, associated with poor human development indicators, increased population in urban areas, poor enforcement of building codes, and climate change (NDRRP, 2018). The country is especially vulnerable to floods, landslides, glacial lake outbursts, and earthquakes due to its location along the Himalayan Arc (Petley et al., 2007; MoHA, 2011). According to Ministry of Home Affairs (MoHA, 2016) data, 22,372 disaster incidents occurred over 45 years (1971-2015). Likewise, 22,372 disaster incidents were reported over 45 years (1971-2015). Thus, Nepal is subject to over 500 disasters per year. According to the research, fire is one of Nepal's most common hazards. The incidence of the most common fires was 7,187, followed by floods (3,720), epidemics (3,448), and landslides (3,448). Based on MoHP/EDCD data, between 2015 and 2020, 5,734 natural disasters (climatic events, earthquakes, floods, landslides, others) and 10,824 human-induced events (fire and others) occurred. Over 700,000 people died from disasters over ten years (2005-2015), over 1.4 million were injured, and approximately 23 million were displaced. Similarly, more than 1.5 billion individuals were affected, resulting in a $1.3 trillion economic loss. Furthermore, monsoonal floods and landslides impact the country yearly, killing hundreds of lives, destroying buildings and key infrastructure, and hampering economic operations (Aksha, 2020).

The 2015 earthquake served as a wake-up call. During this time, policies and programs were developed to revitalize the disaster risk reduction and management paradigm. The Constitution of Nepal, 2015, and the Disaster Risk Reduction and Management Act, 2017, govern Nepal's current disaster governance landscape. (Vij et al., 2020) Local and global policymakers are attempting to improve the resilience of vulnerable countries like Nepal. The government of Nepal has designed and executed several policies and strategies to systematically mitigate the impacts of natural disasters over the last three decades. The new Disaster Risk Reduction and Management Act 2017 was formed by a new federal structure delegating additional financial and administrative functions to local governments (new rural and urban municipalities). In addition, a national policy for disaster risk reduction (NPDRR, 2018) was also drafted. Likewise, DRR was framed in Nepal's 14th ten-year plan and 15th five-year plan, where various measures regarding disaster mortality and resilience building with various measures in agriculture, roads, communication, water supply and sanitation, education, and health facilities. Moreover, different international and national non-governmental organizations (NGOs) functioning in Nepal link their priorities with disaster risk reduction or climate-induced disasters to attract foreign financing and earn the trust of local populations (Gautam & Khanal, 2009).

Nepal's Sudurpashchim and Lumbini Province are particularly vulnerable to several natural disasters, including droughts, floods, landslides, hailstorms, extreme cold

spells, epidemics, and forest fires. Further, the Sudurpashchim Province is remote and developmentally challenged. 44% of people in the Sudurpashchim Province Hills and 49% in the Himalayan districts live below poverty. The combination of disasters and extreme poverty leads to damaged homes, agricultural land, schools, and roads, further exacerbating food insecurity, debt, poverty, and migration. There has been a steady increase in the number of disasters over time, with the total annual number of events has increased threefold between 2015 and 2019. Among the disasters, epidemics floods, and landslides hold first and second positions in terms of loss of lives, accounting for 47.5 and 35.6 percent, respectively (DWIDM, 2015). Furthermore, climate change exacerbates disaster risks and disproportionately affects the most vulnerable populations, such as women, girls, persons with disabilities, people living with HIV/AIDS, gender minorities, single women, and senior citizens (UNDRR, 2019). The main objective of this study is to examine the post-intervention impact on the knowledge and practice regarding disasters among people living in flood-prone areas.

Data and Method

Data for this survey was collected through a cross-sectional research design using quantitative. CARE Nepal and Handicap International implemented a community-based disaster risk reduction project called VISTAR-II in Kailali, Dadeldhura, Kanchanpur, and Dang districts under the DIPECHO-VIIII cycle. The project aimed to strengthen the resilience of communities and institutions to natural disasters through building leadership and management capacities from the community level to the national level. After five years of the VISTAR-II intervention, a Post Project Sustainability Study was conducted in two randomly selected intervention districts, namely Kailali and Kanchanpur. out of the four districts.

The baseline survey was conducted in 2015 with 383 households; the end-line survey was conducted in 2016 with 383 households, and post-project sustainability was conducted in 2021 with 403 households. However, this article uses the data from post-project sustainability for detailed analysis. The study was conducted in four rural municipalities/municipalities in each of the Kailali and Kanchanpur districts of Sudurpashchim Province.

The total households of the project area constituted the sampling frame/population. The households were considered as the sample unit. The 95% confidence level and 5% margin of error were applied while determining the sample size using the following formula. The sample households were selected by Multistage Stratified Simple Random Sampling procedure.

$$n = \frac{Nz^2pq}{Nd^2 + Z^2pq}$$

Where,

n= sample size of the study for households (HH) survey

z= value of standard variation given at confidence level (adopted 1.96 for 95% confidence)

d= margin of error (adopted 5%)

p= estimated proportion of the population (assumed 0.5 to maximize sample size);

q= non-probability= 1-p

N=Total HHs in the study area

The required sample households were selected by Multistage Stratified Simple Random Sampling procedure. In the first stage, two districts out of four districts were selected. In the second stage, two Rural municipalities/municipalities were selected from the project municipality/rural municipalities list. In the third

stage, clusters (wards) were selected. In the last stage (fourth stage), a list of beneficiaries' households was prepared, and a Multistage Stratified Simple Random Sampling procedure selected the required sample households. 403 households (272 female and 131 male) were covered using the above equation. A set of validated structured questionnaires was developed to accumulate quantitative information knowledge and practice of disasters among people living in disaster-prone areas.

Univariate, Bivariate, and multivariate analyses were applied to the data. Initially, univariate or descriptive analysis was used to describe the respondents' socio-demographic characteristics. Then, after controlling for the socio-demographic variables, multivariable analysis was used to identify whether independent variables affected knowledge and practice of disasters. A statistical package for social science (SPSS-26 version) was used for the analysis. The study protocol was reviewed and approved by Nepal Health Research Council (NHRC).

Results and Discussion
Background characteristics of respondents
It was found that most of the respondents (79.4%) were from urban areas, while one-fifth of the respondents (20.6%) were from rural areas. It was observed that slightly over two-thirds of the respondents (67.5%) were female, while nearly one-third (32.5%) of them were male. More than one-fourth (27.5%) of the respondents were from the 25-34 years age groups, followed by one-fourth of respondents (25.1%) from the 35-44 years age group. Meanwhile, more than half of the respondents (56.3%) of the respondents had a basic level of education. Most of the respondents (87.1%) were found to be married. Regarding an ethnic group, two-fifths of the respondents (40%) were Brahmin/Chhetri, while more

than one-third of them (36.2%) were Dalit. Agriculture was found to be the main occupation of about three-fourths of respondents (72.7%) followed by daily wages amongst over one-tenth of the respondents (14.6%). Two-thirds (66%) of respondents were from nuclear families. Besides these, it was found that about three-fourths of the respondents (70.7%) are involved in disaster management or reduction activities.

Table 1
Background characteristics of respondents

		N	%
Place of residence	Urban	320	79.4
	Rural	83	20.6
Gender of respondent	Female	272	67.5
	Male	131	32.5
Age group	Less than 25 years	55	13.6
	25-34	111	27.5
	35-44	101	25.1
	45-54	64	15.9
	55-64	48	11.9
	65 or above	24	6.0
Level of education	Illiterate	81	20.1
	Basic level	227	56.3
	Secondary level	52	12.9
	Higher than secondary	43	10.7
Marital Status	Unmarried	27	6.7
	Married	351	87.1
	Widow/ Widower	25	6.2

Caste/ Ethnic- ity	Brahmin/ Chhetri	161	40.0
	Dalit	146	36.2
	Janajati	96	23.8
Occu- pation	Agriculture	293	72.7
	Daily wages	59	14.6
	Small business/ service	26	6.5
	Student	25	6.2
Type of family	Nuclear family	266	66.0
	Joint family	137	34.0
Involve- ment in disaster man- age- ment/ reduc- tion activi- ties	No	118	29.3
	Yes	285	70.7
Total		403	100.0

Knowledge of types of disaster

Knowledge of the types of disasters has increased over time. The respondents' average knowledge of various types of disasters was 24.5 in the baseline and 32.9 in the end-line survey, which increased to 44.08 in the PPS survey (figure 1).

The knowledge of respondents on the types of disasters was assessed in the study. The findings of the study showed that almost all respondents (99.5%) knew about the flood, followed by storm (82.4%) and fire (77.4%).

It was found that the respondents' knowledge of various types of disasters was more excellent among those living in the urban area, i.e., Flood (99.7%), storm (85.6%), fire (81.3%), landslide (65.9%). In contrast, the knowledge of hailstorm (50.6%) and drought (53%) was comparatively higher in rural areas. Likewise, cent percent of the male respondents knew about a flood. Further, almost all respondents from different age groups knew about the flood. Most respondents (89.6%) from the age group 55-64 years, followed by 88.3% amongst the 25-34 age group, knew the storm. All respondents with a secondary and higher secondary level of education knew about the flood. The proportion of respondents who know the storm was found to be comparatively higher among those with basic (86.3%) and secondary levels of education (84.6%). The knowledge regarding flood (100%), landslide (77.8%), and earthquake (70.4%) was found to be higher among unmarried respondents. In terms of ethnicity, Dalit respondents have a comparatively higher proportion of knowledge regarding floods (100%), landslides (70.5%), and earthquakes (52.7%). Besides these, the joint family

Figure 1.
Average knowledge of types of disasters by surveys
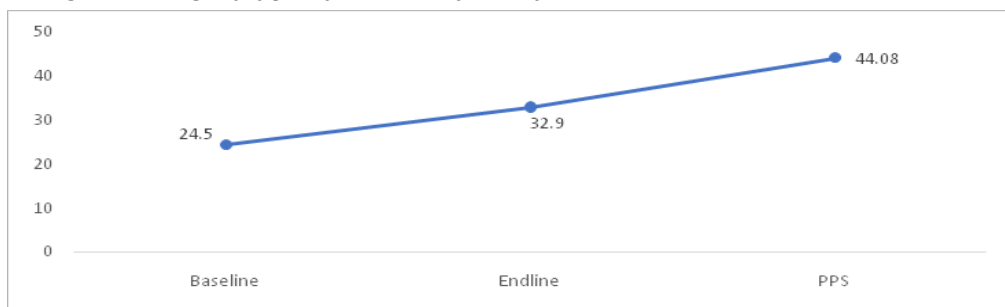
has comparatively more knowledge about floods (100%), landslides (73%), fires (79.6%), and earthquakes (59.1%).

Table 2
Knowledge of types of disaster

		Flood	Land-slide	Earth-quake	Fire	Storm	Hail-storm	Epi-demics	Drou ght	To-tal N
Place of resi-dence	Urban	99.7	65.9	53.8	81.3	85.6	31.3	36.6	44.4	320
	Rural	98.8	30.1	28.9	62.7	69.9	50.6	14.5	53.0	83
Gender of re-spondent	Female	99.3	58.1	48.2	74.6	82.0	35.3	29.0	43.0	272
	Male	100.0	59.5	49.6	83.2	83.2	35.1	38.2	52.7	131
Age group	Less than 25 years	100.0	76.4	61.8	65.5	67.3	27.3	34.5	47.3	55
	25-34	99.1	70.3	52.3	82.0	88.3	33.3	35.1	45.9	111
	35-44	100.0	57.4	51.5	76.2	80.2	29.7	28.7	50.5	101
	45-54	98.4	45.3	45.3	78.1	84.4	43.8	26.6	45.3	64
	55-64	100.0	43.8	33.3	79.2	89.6	47.9	31.3	43.8	48
	65 or above	100.0	33.3	29.2	83.3	79.2	37.5	41.7	33.3	24
Level of educa-tion	Illiterate	98.8	43.2	39.5	72.8	75.3	38.3	25.9	32.1	81
	Basic level	99.6	58.6	48.9	80.6	86.3	33.5	30.4	48.5	227
	Sec-ondary level	100.0	69.2	53.8	69.2	84.6	42.3	38.5	53.8	52
	Higher than second-ary	100.0	74.4	58.1	79.1	72.1	30.2	44.2	51.2	43
Marital Status	Unmar-ried	100.0	77.8	70.4	70.4	63.0	25.9	40.7	48.1	27
	Married	99.7	57.5	47.6	77.8	83.8	36.8	30.5	47.0	351
	Widow/Widow-er	96.0	52.0	40.0	80.0	84.0	24.0	44.0	32.0	25
Caste/Ethnicity	Brah-min/Chhetri	99.4	57.1	50.9	73.9	80.7	41.0	36.0	44.7	161
	Dalit	100.0	70.5	52.7	82.2	86.3	31.5	28.8	53.4	146
	Janajati	99.0	42.7	38.5	76.0	79.2	31.3	30.2	37.5	96
Occupa-tion	Agricul-ture	99.3	56.0	45.1	76.5	85.0	39.2	31.4	46.1	293
	Daily wages	100.0	54.2	52.5	79.7	79.7	28.8	32.2	42.4	59
	Small busi-ness/service	100.0	76.9	57.7	88.5	80.8	15.4	30.8	61.5	26
	Student	100.0	80.0	72.0	72.0	60.0	24.0	40.0	40.0	25

Type of family	Nuclear family	99.2	51.1	43.2	76.3	84.2	40.2	27.1	48.9	266
	Joint family	100.0	73.0	59.1	79.6	78.8	25.5	41.6	40.9	137
Total		99.5	58.6	48.6	77.4	82.4	35.2	32.0	46.2	403

Knowledge on the impacts of disaster

The knowledge regarding the impacts of the disaster was also assessed in the study. The majority of the respondents (86.8%) mentioned the loss of human life and property as an impact of disaster, followed by a shortage of food (58.1%) and a residence/settlement problem (53.8%).

It was observed that most of the respondents from the urban area mentioned that loss of human life and property due to outbreaks was a major impact of the disaster. Meanwhile, the majority of respondents from the rural area knew the loss of human life and property (79.5%), followed by shortage of food (75.9%) and spread of epidemic (72.3%) as the impacts of disasters. It was found that an overwhelming proportion of males (92.4%) stated loss of human life and property as an impact of a disaster. Furthermore, most respondents (92.7%) from the age group under 25 mentioned the loss of human life and property as an impact of the disaster. The proportion of respondents mentioning the loss of human life and property as an impact of the disaster was found to be higher among those who had secondary and higher secondary levels of education.

Table 3

Knowledge on the impacts of disaster (in %)

		Loss of human life and property due to the outbreak	Spread of epidemic	Shortage of food	Residence/ Settlement problem	Total N
Place of residence	Urban	88.8	48.1	53.4	60.6	320
	Rural	79.5	72.3	75.9	27.7	83
Gender of respondent	Female	84.2	53.7	57.4	55.5	272
	Male	92.4	51.9	59.5	50.4	131
Age group	Less than 25 years	92.7	49.1	50.9	70.9	55
	25-34	85.6	55.9	64.0	60.4	111
	35-44	91.1	57.4	55.4	51.5	101
	45-54	85.9	42.2	62.5	56.3	64
	55-64	81.3	56.3	58.3	33.3	48
	65 or above	75.0	54.2	45.8	29.2	24
Level of education	Illiterate	80.2	53.1	64.2	50.6	81
	Basic level	85.9	54.6	54.2	48.9	227
	Secondary level	94.2	51.9	63.5	63.5	52
	Higher than secondary	95.3	46.5	60.5	74.4	43
Marital Status	Unmarried	96.3	51.9	59.3	85.2	27
	Married	86.9	54.4	60.1	51.9	351
	Widow/Widower	76.0	36.0	28.0	48.0	25

Caste/Eth-nicity	Brahmin/Chhetri	85.7	57.8	61.5	51.6	161
	Dalit	92.5	45.2	54.8	54.1	146
	Janajati	80.2	57.3	57.3	57.3	96
Occupation	Agriculture	86.0	54.6	59.7	49.8	293
	Daily wages	81.4	49.2	57.6	55.9	59
	Small business/ service	100.0	53.8	50.0	65.4	26
	Student	96.0	44.0	48.0	84.0	25
Type of family	Nuclear family	85.0	57.5	56.4	51.5	266
	Joint family	90.5	44.5	61.3	58.4	137
Total		86.8	53.1	58.1	53.8	403

Knowledge on the requirement of the HH level plan to mitigate the effect of disaster

Bivariate analysis showed a significant association of knowledge on the requirement of the HH level plan to mitigate the effect of disaster with caste/ethnicity and occupation. The knowledge of the requirement of the HH-level plan to mitigate the effect of disaster was mentioned by nearly one-fourth of the respondents (23.8%).

It was found that the knowledge of the requirement of the HH level plan to mitigate the effect of disaster was found to be significantly higher among Dalits (25.3%) (p<0.001). Likewise, the occupation of the respondents was also found to be significantly associated with the knowledge of the requirement of the HH-level plan to mitigate the effect of disaster. A higher proportion of those who had knowledge of the requirement of the HH level plan to mitigate the effect of disaster was found high among those who had a small business (50%). Besides these, the study's findings revealed that one-fourth of the respondents (25%) from the urban area knew about the requirement of the HH-level plan to mitigate the effect of disaster. Likewise, more than one-fourth of the male respondents (29%) knew about the requirement of the HH than females (21.3%). Additionally, one-fourth of the respondents from each age group, i.e., less than 25 years and 25-34 years old age group knew about the requirement of the HH level plan. The proportion of the respondents who knew about the requirement of such a plan was higher among those who had a higher secondary level of education (27.9%).

Table 4

Knowledge on the requirement of the HH level plan to mitigate the effect of disaster

		No	Yes	Total N	Chi-square and p-value
Place of residence	Urban	75.0	25.0	320	Chi square=1.19 and p=0.275
	Rural	80.7	19.3	83	
Gender of respondent	Female	78.7	21.3	272	Chi square=2.88 and p=0.090
	Male	71.0	29.0	131	
Age group	Less than 25 years	74.5	25.5	55	
	25-34	74.8	25.2	111	
	35-44	75.2	24.8	101	Chi square=0.74 and p=0.98
	45-54	78.1	21.9	64	
	55-64	79.2	20.8	48	
	65 or above	79.2	20.8	24	

Level of education	Illiterate	84.0	16.0	81	Chi square=0.54 and p=0.76
	Basic level	74.0	26.0	227	
	Secondary level	76.9	23.1	52	
	Higher than secondary	72.1	27.9	43	
Marital Status	Unmarried	70.4	29.6	27	Chi square=0.64 and p=0.72
	Married	76.6	23.4	351	
	Widow/Widower	76.0	24.0	25	
Caste/Ethnicity **	Brahmin/Chhetri	78.3	21.7	161	Chi square=12.19 and p=0.007
	Dalit	74.7	25.3	146	
	Janajati	75.0	25.0	96	
Occupation **	Agriculture	79.2	20.8	293	Chi square=12.19 and p=0.007
	Daily wages	76.3	23.7	59	
	Small business/service	50.0	50.0	26	
	Student	68.0	32.0	25	
Type of family	Nuclear family	75.6	24.4	266	Chi square=.16 and p=0.69
	Joint family	77.4	22.6	137	
Total		76.2	23.8	403	

Note *** Significant at P < 0.001, ** = p < 0.01 and * = p < 0.05

Adjusted odds ratios (aOR) were calculated from multivariate logistic regression for knowing the requirement of the HH level plan to mitigate the effect of disaster. Multivariate analysis shows that occupation was significant predictors for knowing the requirement of the HH level plan to mitigate the effect of disaster.

Respondents whose major source of income was small business/service were 3 times (aOR= 3.58, 95% CI= 1.46- 8.81) more likely to know about the requirement of the HH level plan to mitigate the effect of a disaster than those whose source of income was agriculture.

Table 5

Adjusted odds ratios (aOR) from multivariable logistic regression for having knowledge on the requirement of the HH level plan to mitigate the effect of disaster

Selected predictors		aOR	95% CI	
		Lower	Upper	
Place of residence	Urban	1.00		
	Rural	.824	.427	1.590
Gender of respondent	Female	1.00		
	Male	1.824	.969	3.432
Age group	Less than 25 years	1.00		
	25-34	1.049	.377	2.919
	35-44	.963	.331	2.803
	45-54	.802	.240	2.677
	55-64	.727	.192	2.757
	65 or above	.598	.120	2.976

Level of education	Illiterate	1.00		
	Basic level	1.670	.789	3.535
	Secondary level	1.139	.393	3.304
	Higher than secondary	1.119	.349	3.586
Marital Status	Unmarried	1.00		
	Married	1.572	.190	13.029
	Widow/Widower	2.952	.266	32.737
Caste/Ethnicity	Brahmin/Chhetri	1.00		
	Dalit	1.255	.702	2.243
	Janajati	1.374	.707	2.668
Occupation	Agriculture	1.00		
	Daily wages	.862	.412	1.801
	Small business/service	3.582**	1.456	8.811
	Student	3.214	.374	27.635
Type of family	Nuclear family	1.00		
	Joint family	.787	.468	1.321
Constant			*.103*	
-2 Log likelihood			*422.369ᵃ*	
Cox & Snell R Square			*.049*	
Nagelkerke R Square			*.073*	

Note ** Significant at p < 0.01

Inclusion of most vulnerable groups

Bivariate analysis showed a significant association of knowledge on the inclusion of most vulnerable groups (women, people with disabilities, children, elderly, and other marginalized groups) in delivery of disaster-related services with the place of residence, age group, level of education, caste/ethnicity, and type of family.

During disasters, the most vulnerable groups require special protection. Such groups include pregnant and lactating women, children, senior citizens, disabled persons, etc. The knowledge on the inclusion of most vulnerable groups in the delivery of disaster-related services was found significantly higher among respondents from urban areas (55%) (p<0.001). Likewise, the inclusion of most vulnerable groups in the delivery of disaster-related services was significantly higher among respondents who were 25-34 years old (53.2%) and 55-64 years old (p<0.001). Similarly, it was found that about half of the respondents (48.5%) who had a basic level of education stated the inclusion of most vulnerable groups while delivering disaster-related services. An equal proportion of the respondents (22%) who were married or widows/widowers stated the need for the inclusion of the most vulnerable groups in the delivery of disaster-related service. Meanwhile, respondents' age group was also found to be associated with the knowledge on the inclusion of most vulnerable groups in the delivery of disaster-related services (0<0.05). Nearly half of the respondents (48.5%) who had completed the basic level of education knew about the inclusion of most vulnerable groups in the delivery of disaster-related services. Moreover, the caste/ethnicity of the respondents was also

significantly associated with the knowledge on the inclusion of most vulnerable groups in the delivery of disaster-related services (p<0.001). Besides these, a significant proportion of respondents who has a joint family (63.5%) had higher knowledge on the inclusion of most vulnerable groups in the delivery of disaster-related services than those who had nuclear family (33.8%) (p<0.001).

Table 6

Inclusion of most vulnerable groups in delivery of disaster related service

		Yes	No	Don't know	N	Chi-square and p value
Place of residence ***	Urban	55.0	31.9	13.1	320	Chi-square=115.6 and p=0.000
	Rural	1.2	34.9	63.9	83	
Gender of respondent	Female	42.6	34.6	22.8	272	Chi-square=1.6 and p=0.447
	Male	46.6	28.2	25.2	131	
Age group ***	Less than 25 years	34.5	43.6	21.8	55	Chi-square=24.8 and p=0.006
	25-34	53.2	31.5	15.3	111	
	35-44	41.6	39.6	18.8	101	
	45-54	42.2	25.0	32.8	64	
	55-64	47.9	20.8	31.3	48	
	65 or above	29.2	25.0	45.8	24	
Level of education*	Illiterate	32.1	32.1	35.8	81	Chi-square=12.9 and p=0.045
	Basic level	48.5	30.0	21.6	227	
	Secondary level	42.3	36.5	21.2	52	
	Higher than secondary	44.2	41.9	14.0	43	
Marital Status	Unmarried	40.7	48.1	11.1	27	Chi-square=6.7 and p=0.115
	Married	44.2	32.2	23.6	351	
	Widow/Widower	44.0	20.0	36.0	25	
Caste/Ethnicity ***	Brahmin/Chhetri	40.4	33.5	26.1	161	Chi-square=41.3 and p=0.000
	Dalit	62.3	24.7	13.0	146	
	Janajati	21.9	42.7	35.4	96	
Occupation	Agriculture	43.7	31.7	24.6	293	Chi-square=8.4 and p=0.21
	Daily wages	45.8	25.4	28.8	59	
	Small business/service	50.0	42.3	7.7	26	
	Student	36.0	48.0	16.0	25	
Type of family***	Nuclear family	33.8	36.5	29.7	266	Chi-square=34.4 and p=0.000
	Joint family	63.5	24.8	11.7	137	
Total		43.9	32.5	23.6	403	

Note *** Significant at P < 0.001, ** = p < 0.01 and * = p < 0.05

Adjusted odds ratios (aOR) were calculated from multivariate logistic regression for inclusion of most vulnerable groups (women, people with disabilities, children, elderly, and other marginalized groups) in the delivery of disaster-related service. Multivariate analysis shows an occupation of the respondents was significant predictors for inclusion of most vulnerable groups (women, people with disabilities, children, elderly, and other marginalized groups) in the delivery of disaster-related service. Those respondents who were involved in small business/ service were about 6 times (aOR=5.6, 95% CI=2.03-8.5) more likely to include most vulnerable groups in the delivery of disaster-related services than respondents who involved in agriculture.

Table 7

Adjusted odds ratios (aOR) from multivariable logistic regression for Inclusion of most vulnerable groups in delivery of disaster related service

Selected predictors		aOR-Lower	95% CI	
			Upper	
Place of residence	Urban	1.00		
	Rural	.551	.207	1.468
Gender of respondent	Female	1.00		
	Male	2.201	.974	4.971
Age group	Less than 25 years	1.00		
	25-34	2.021	.491	8.313
	35-44	1.039	.223	4.835
	45-54	.812	.138	4.793
	55-64	.676	.101	4.545
	65 or above	1.044	.122	8.923
Level of education	Illiterate	1.00		
	Basic level	1.093	.380	3.143
	Secondary level	1.106	.269	4.547
	Higher than secondary	3.170	.783	12.836
Marital Status	Unmarried	1.00		
	Married	.510	.051	5.109
	Widow/Widower	.648	.037	11.233
Caste/Ethnicity	Brahmin/Chhetri	1.00		
	Dalit	.734	.328	1.642
	Janajati	1.243	.536	2.882

Occupation	Agriculture	1.00		
	Daily wages	1.202	.464	3.116
	Small business/service	5.614**	2.034	8.499
	Student	.637	.056	7.205
Type of family	Nuclear family	1.00		
	Joint family	.871	.440	1.725
Constant			.131	
-2 Log likelihood			266.3	
Cox & Snell R Square			.102	
Nagelkerke R Square			.191	

Note *** Significant at P < 0.001, ** = p < 0.01 and * = p < 0.05

Discussion & Conclusion

This study assessed the knowledge and practices regarding disasters among people living in flood-prone areas of Nepal. Although there is a slight increase in disaster-related knowledge among the community, it is still very low. Similarly, knowledge of the need for a household-level plan to mitigate disaster is also low. This study found that place of residence, age of respondents, Level of education, caste/ethnicity, and type of family were significantly associated with including the most vulnerable group in delivering disaster-related services. The study's findings revealed that many variables were associated with knowing the requirement of the HH-level plan to mitigate the effect of disaster and for the inclusion of the most vulnerable groups in the delivery of disaster-related service. Thus, programs that advocate the importance of following disaster mitigation measures at the community and household level should be targeted to motivate people to be self-equipped to tackle possible disaster incidents.

Acknowledgment

References

Aksha, S. K., & Emrich, C. T. (2020). Benchmarking community disaster resilience in Nepal. *International journal of environmental research and public health*, 17(6), 1985. https://doi.org/10.3390/ijerph17061985/

DWIDM (2006). *Water induced disaster management policy 2006*. Kathmandu: Department of Water Induced Disaster Management.

Gautam, D (2020). COVID-19 and Social Protection: What Are the Next Steps? In Spotlight, June 11.

Gautam, D.R. & Khanal, S. (2009). Community Based Disaster. Risk Reduction: Contribution to Hyogo Framework of Action – Case Study. Retrieved from : https://www.preventionweb.net/publication/community-based-disaster-risk-reduction-contribution-hyogo-framework-action-case-study/

MoHA (2018). *National Policy for Disaster Risk Reduction, 2018.* Ministry of Home Affairs. Government of Nepal. Retrieved from:http://drrportal.gov.np/uploads/document/1476.pdf

Maplecroft 2011. Climate Change Vulnerability Index. Where will your business face the greatest threats from climate change?

MoHA (2018). *Disaster Risk Reduction National Strategic Plan of Action 2018–2030*. Ministry of Home Affairs. Government of Nepal. Retrieved from: http://neoc.gov.np/en/news/national-disaster-risk-reduction-strategic-action-plan-2018-2030-50.html

Nepal, P., Khanal, N. R., & Pangali Sharma, B. P. (2018). Policies and institutions for disaster risk management in Nepal: A Review. *Geographical Journal of Nepal*, 11, 1–24. Retrieved from: https://www.nepjol.info/index.php/gjn/article/view/19546/

Petley, D.N., Hearn, G.J., Hart, A., Rosser, N.J., Oven, K.J., & Mitchell, W.A. (2007). Trends in landslide occurrence in Nepal. *Natural Hazards*, (43): 23–34.

Subedi, S & Chhetri, M. (2019). Impacts of the 2015 Gorkha Earthquake: Lessons Learnt from Nepal. 10.5772/intechopen.85322.

UNDRR (2019). Disaster Risk Reduction in Nepal: Status Report 2019. Bangkok, Thailand, United Nations Office for Disaster Risk Reduction (UNDRR), Regional Office for Asia and the Pacific. Retrieved from: https://reliefweb.int/report/nepal/disaster-risk-reduction-nepal-status-report-july-2019

Vij, S., et al. (2020). Evolving disaster governance paradigms in Nepal. *International Journal of Disaster Risk Reduction*, Volume 50,2020,101911,ISSN 2212-4209, https://doi.org/10.1016/j.ijdrr.2020.101911/