Public perception of flood risks and warnings in the flood-prone Kashmir Valley, India

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Floods are the most recurrent of all natural disasters in Kashmir Valley, Jammu and Kashmir, India, affecting both society and economy. Despite various efforts to prevent loss of lives and assets during floods, a crucial component of flood management, i.e. how the inhabitants perceive flood risk, is not well-known in the region. A questionnaire-based survey was conducted in flood-prone regions of the Valley to gain information on how public understands the risk of flooding in their area, their flood preparedness, knowledge about floods and the trust in various institutions for managing floods and disseminating flood warnings. Respondent demographics was then linked with their answers to establish potential correlations. Responses illustrate that the respondents consider floods as the most important natural disaster in the Valley and most of them mention that the risk is increasing. Results show that the respondents have average knowledge regarding floods, flood protection measures and emergency actions in case of floods. At the individual level, they had not taken adequate steps for safeguarding themselves or their families against floods. The characteristics of respondents namely age, gender, income, education level and previous experience with floods showed statistically significant correlations with the responses. In general, the findings of the study call for better education of the inhabitants regarding flood risks and management actions as well as improvement of existing methods of flood forecasting and warning in the region.

Keywords: Flood forecasting and warning, public perception, question-based survey, risk estimation.

FLOOD perception has recently been recognized as a critical component of flood mitigation and management[1]. Conventional means of risk estimation have been gradually integrated with social aspects for comprehensive risk assessment. An early flood warning system (EFWS) is an essential element of disaster risk management strategies. Contrary to the flood forecasting systems, which assess flood risks, the primary purpose of the EFWS is to issue warnings before the incidence of a flood or when it has occurred[2]. EFWS enhances the community preparedness for floods, both in terms of warnings and developing flood risk perception and relevant flood responses.

A crucial element of any EFWS is the dissemination of forecasts to the concerned end-users. Timely dissemination of forecasts must occur in a simple and comprehensible manner. Further, the flood-affected community should believe the forecast and act accordingly[3]. The attitude of the affected people towards the warning plays a crucial role in the success of any EFWS. Although such systems are operating in many parts of the world, they do not translate into an emergency response every time from every individual at risk. Also, the effectiveness of an EFWS depends on the information offered by the warning, method of dissemination, trust worthiness of the warning among recipients, their perception and response to it[4]. Although novel technologies have remarkably increased the likelihoods of weather and hydrological forecasts, the warning systems usually underperform because the warning, dissipation and response of the end-users are unsatisfactory. The number of flood victims is high, mainly because of the lack of knowledge and proper action by those affected by floods[5]. The behaviour of people to flood risks and warnings has received limited attention in studying the efficiency of flood-warning systems. It has been established that the generation of technically dependable early warnings is futile if it does not transform into emergency response effort[6]. Misinterpretation of the warnings and ineffective coordination among stakeholders may cause complete failure to respond to flood alerts.

Flood risk mitigation is an extensive and permanent development. For an alliance that encompasses time and space, it should additionally involve all players – the dwellers, local and provincial authorities, and government organizations. There is a general dearth of understanding about hazards. However, we require more comprehensive knowledge of the vulnerability, which comprises the attitude of people involved in warning and implementation. Disaster risk perception of people is aimed at implementing effective flood risk management and mitigation policies. This is because the behaviour of people during a

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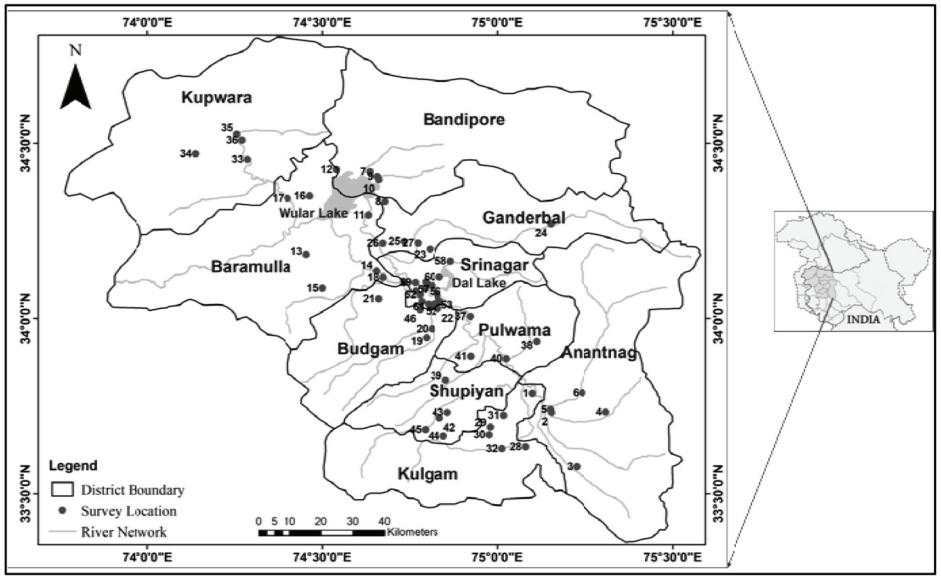

Figure 1. Location map of Kashmir Valley, India, showing various districts and locations selected for the survey.

disaster depends on their risk attitudes towards the event[7]. Although flood control and warning measures can reduce flood risk, human behaviour being irrational can cause behavioural deviation. Thus, the desired results of flood forecasting and warning cannot be achieved only by technical means[8]. Also, residents of a flood-prone region are both victims during a flood and executors of the policies for disaster mitigation and prevention. Therefore, studying their behaviour is vital for understanding their attitude towards policies.

Many researchers have studied the link between various factors defining risk perception and flood mitigation. These include demographics of the inhabitants[9], previous flood experience[10], location[11], duration of residence[12], trust in local organizations[13], sources of warnings and information[14], and laypersons' familiarity with flood mitigation and management[15]. The correlation between these variables and risk perception has been established as a reliable tool for improving flood risk management when combined with flood risk estimation. The dearth of information on public perception of flood risks and warnings can lead to underestimation of risks or overestimation of personal preparedness measures[16].

This article details the results of a survey about flood risk perceptions, flood warnings and preparedness undertaken in Kashmir Valley (Jammu and Kashmir), India. The results of the survey present a reference-point knowledge of the prevailing issues concerning floods for respondents in the Valley. Kashmir Valley has a long history of flood disasters. Floods are the most common natural disasters in the Valley. At present, there are no identified studies in Kashmir Valley that document flood risk perceptions and preparedness of the people. Given the dearth of reliable studies on various aspects of flood risk perception and flood preparedness in Kashmir Valley, this study focuses on the individual's perception of flood risks in the flood-prone regions of the Valley. Despite being essential stakeholders in flood management and mitigation programmes, inhabitants have not ever been consulted before their implementation. Therefore, this study aims to (1) Offer a basic insight into how people perceive flood risk in Kashmir Valley, explore their prevention measures and strategies, their knowledge of flood warnings and trust towards various local authorities. (2) Determine the correlations between the aforementioned factors and respondent demographics and past flood experiences. (3) Add information on public perceptions and their preparedness for floods in the flood-prone Kashmir Valley.

Methodology

Study area

Kashmir Valley is a part of the Western Himalaya. It lies between the Greater Himalayas to the northeast and the Pir Panjal Range to the southwest. Kashmir Valley is an intermontane fault basin 40 km wide and has a diagonal length of 135 km from NNW to SSE[17]. River Jhelum meanders through the entire length of the oval-shaped Valley before finally exiting through a deep gorge in Baramulla. The geographical extent of the valley is between 32°58′42″–35°08′02″N and 73°23′32″–75°35′57″E, and covers a total area of 34,775 sq. km (ref. 17). There are ten administrative districts in the valley, namely Anantnag, Baramulla, Budgam, Bandipora, Ganderbal, Kupwara, Kulgam, Pulwama, Shupiyan and Srinagar (Figure 1). According to the 2011 census, the total population of

Kashmir Valley was nearly 6.9 million[18]. The average population growth rate during 2001–11 was 26.21%, with a population density is 676/sq. km.

Floods in Kashmir Valley

Kashmir Valley is an extremely flood-prone region of the Greater Himalaya, and floods inundate the region almost every alternate year. The low-lying regions of the Valley being precipitous are susceptible to flooding, especially during long precipitation hours. Floods, among other disasters, pose severe threat to over 6 million people living in the Valley[19]. Since AD 635, many catastrophic floods have occurred in Kashmir Valley. It has witnessed disastrous floods in 1893, 1928, 1950, 1959, 1992, 2010 and more recently in 2014, 2015, 2017 and 2019 (ref. 20).

During the devastating flood of 2014, which caused inundation in large parts of the Valley, about 557 sq. km was flooded[21]. This encompasses nearly 3.5% of the geographical area of the Valley. Over 2600 villages were affected by the floods, of which 800 were completely submerged. Nearly 300 villages were left inaccessible and about 30% of the urban area was inundated. A preliminary property-damage assessment was estimated to be between INR 50,000 million and INR 60,000 million. Over 1.25 million families were affected and 281 people died because of the flood[22]. Electricity and communication channels were entirely cut throughout the Valley, making coordination, rescue and evacuation almost impossible.

Sample selection and data collection

A questionnaire-based survey was conducted from August to September 2020 in ten districts of Kashmir Valley, all affected by floods. The survey was conducted at 62 locations across all districts (Figure 1). These locations were selected on the basis of flood vulnerability. More samples were taken in the high flood-risk zones and city centre than those in the low-risk zones. Srinagar is the summer capital of J&K and the largest urban centre in Kashmir Valley. The population density is very high and a significant portion inhabits the low-lying flood-prone area. Many commercial establishments, major hospitals, besides numerous Government and non-Government offices are also located here. In view of the large population in the region and to achieve satisfactory sample representation, the questionnaire was distributed in collaboration with the heads of villages or localities. According to the 2011 Census, the overall literacy rate in Kashmir Valley is 63.3%. Srinagar has the highest literacy rate of 71.2%, while Bandipore has the lowest of 57.8%. Srinagar district has the largest number of graduates and postgraduates in the Valley. Economically, most people of Kashmir Valley are self-employed, i.e. in agriculture and local industries. Various small-scale industries like carpet-weaving, making wooden furniture, copperware and silverware are a source of employment to a large number of people. A significant number of people are employed in the Government and private sector. Thus, the final sample of participants consisted of people living in different locations and having a demographic profile similar to that of the general population.

In all, 600 questionnaires were distributed and 497 completed questionnaires were received. The response rate of the survey was 82.8%. Two hundred questionnaires were distributed across 17 different locations of Srinagar city. The respondents in each area were instructed about the purpose of the study before filling in the questionnaire. Participation of respondents was voluntary and sufficient time was given. These questionnaires were analysed using SPSS Statistics version 27.0.1.0 (SPSS Inc., Chicago, IL, USA).

Questionnaire design

The method of this study was based on a survey of the opinion of the inhabitants. A semi-structured questionnaire examined the present status of flood warnings and public perception of flood risks. Before the formal survey, some respondents from the same area were chosen to fill in the questionnaire. Based on their feedback, professional vocabulary was replaced with simple vocabulary, and some questions were removed. The introductory part of the questionnaire highlights the purpose of the survey. It informs the respondents about the purpose of data collected and its relevance to them.

The first section comprises questions concerning key socio-demographic factors of the respondents. Questions regarding age, gender, education level, occupation, place of permanent residence and residence time in that area were included in this section. Socio-demographic factors provide insight into the respondents' background and help analyse the results better[23].

Questions with respect to flood risk perceptions of the inhabitants were included in the second section of the questionnaire. These were questions on knowledge and awareness of floods, importance of flood risks, likelihood of floods in the near future and regional flood knowledge. In the third section, respondents were asked about being prepared for floods; how they have prepared to face a flood disaster and whether the damages incurred by floods are covered by flood insurance. The fourth section included questions concerning existing means of early flood warning dissemination. Questions on trust in local authorities for managing floods and disseminating warnings were also included in this section.

Methods for data analysis

Different statistical tests were used to analyse the responses. Statistical tests were selected based on theoretical

conditions, purpose of research along with nominal and ordinal ranks of variables to establish potential correlations amongst them. In order to describe the data quantitatively, descriptive analysis was first performed. This helped in summarizing the features of each research variable. Thereafter the variables were analysed using various non-parametric tests owing to their asymmetric distribution[24]. These were the chi-square test of independence, Spearman's rho test, Mann–Whitney *U*-test and Kruskal–Wallis test. Initially, the relationship between ordinal variables was examined by Spearman's rho test. Kruskal–Wallis test was used to assess the probable links between some respondents' perceptions and their independent demographic characteristics (age). Mann–Whitney *U*-test was used to analyse the link between some answers by the respondents and their binary demographical features (gender)[25]. Finally, the χ^2 test for independence was used to examine the relationship between two nominal variables. In a χ^2 test, the frequency of each category for one nominal variable is compared across the categories of the second nominal variable[26]. All tests were performed at 5% level of significance[27].

Results

Representativeness of the samples

Among the 497 respondents, the percentage of male and female respondents was nearly the same, accounting for 53.1% and 46.9% respectively (Table 1). Respondents aged 21–60 years were the majority, constituting 78% of the total respondents. A comparable percentage of respondents belonged to the age group <20 years (10.5) and above 60 years (11.5). Regarding education level, most respondents (30.8%) were graduates, 19.5% were postgraduates or above, while 14.3% were educated up to middle school or below. Income varied in our sample, with 39.7% under INR 200,000 per annum, 51.4% between INR 200,000 and 500,000 and 8.9% over INR 500,000. Occupation types were classified into six classes. The self-employed class included those involved in agriculture, horticulture and running their own businesses. This made up the highest percentage of respondents (24.7) and was closely followed by people working in the private sector (24.1). Nearly 20.7% of respondents were employed in the Government sector. A small percentage of respondents were students (9.3) and those retired from Government services (5). Several other occupation types, including those who are unemployed and homemakers, were grouped under 'others' and formed 16.1 of the total respondents.

Most of the respondents (95.6%) owned their residence, while the rest lived in rented houses. The mean residence time of the respondents at the place of survey was 29.2 years. Only 61 respondents (12.3%) were living in the present location for less than 10 years. Thus, the familiarity of the population with the region, and their knowledge about local floods and flood warning systems can be considered reliable[28].

Flood risk perception

In this survey, samples were collected from flood-prone areas. The questionnaire asked the respondents to make risk perception judgement in their area based on their concern for various natural disasters. Flood risk was rated as 'most important' by majority of respondents (42.3%) and as 'important' by 37.2% of the respondents (Figure 2). While 12.5% considered flood risks are of moderate importance, 5% and 3% mentioned these as low and not important. Floods ranked first when compared to other natural disasters, namely earthquakes, snowstorms and landslides in terms of concern amongst the respondents.

Earthquakes were the second most important natural disaster concerning the inhabitants of the surveyed locations (Figure 2). Floods also ranked first on a scale of 1–5, with an average of 4.11, followed by earthquakes (3.56), snowstorms (3.43) and landslides (2.57).

Table 1. Descriptive analysis of socio-demographic characteristics of the respondents (n = 497)

Variables	Frequency (n)	Percentage (%)
Gender		
Male	264	53.1
Female	233	46.9
Age (years)		
<20	52	10.5
20–60	388	78.1
>60	57	11.5
Income		
<200,000	197	39.7
200,000–500,000	255	51.4
>500,000	44	8.9
Education		
Middle school or below	71	14.3
High school	80	16.1
Higher secondary	96	19.3
Graduate	153	30.8
Postgraduate and above	97	19.5
Occupation		
Government employee	103	20.7
Private job	120	24.1
Self-employed	123	24.7
Student	46	9.3
Others	80	16.1
Retired	25	5.0
Duration of residence (years)		
<10	61	12.3
11–25	166	33.4
26–50	226	45.5
>50	44	8.9

The respondents were asked to assess their knowledge of floods (self-assessment). Most of them ranked their knowledge as 'average' (44.1%), followed by 'high' (23.7%), 'poor' (21.1%), 'very poor' (9.7%) and 'very high' (1.4%). The average score of the respondents regarding the level of flood knowledge was 2.87 (where 1 denotes very poor and 5 denotes very high). Regarding the respondents' knowledge of measures to be adopted in case of a flood, the largest fraction of population rated it as 'poor' (46.1%) and 'average' (25.6%), followed by 'high' (18.9%), 'very poor' (6.5%) and 'very high' (2.9%). The average score of the respondents for this factor was 2.66. The responses show that the respondents have roughly above-average knowledge regarding floods as well as measures adopted at the time of a flood emergency.

Of the total respondents, 37.6% had never experienced a flood at their residence. They were however, affected directly or indirectly because of floods in the nearby areas. Overall, 45.4% of respondents perceived the extent of damage because of floods as normal, 39.1% as immense, and 15.5% mentioned that there was no or minor damage. When asked about the changing trend of floods in the valley, most respondents (52.3%) mentioned that the number of flood events had increased, while 35.8% of respondents mentioned that there was no trend, 9.4% that flood events were decreasing, while only 2.5% mentioned that they did not know of the flood trends.

When asked about the possibility of a future flood in the next five years, the highest percentage of participants (35.3) answered with 'likely'. This was followed by 'neither likely nor unlikely', which was the answer of 28.6% of the respondents. A low percentage of respondents selected 'very likely' (7.6) and 'very unlikely' (5.7).

The respondents predominantly showed a prominent concern for flooding, proven by the extent of severity they associate with floods compared to other natural disasters. These responses illustrate that the inhabitants are concerned about the increasing flood risks and the probability of occurrence of a flood in the near future.

Flood preparedness

Regarding the flood mitigation measures or actions, the respondents displayed very low preparedness levels. When asked if the respondents or their families had made any arrangements for protecting themselves, their families, properties, etc. from floods, 74.2% replied 'No' and 28.4% replied 'Yes'. Figure 3 summarizes flood preparations measures taken by the respondents.

The relevant equipment bought by the respondents included pumps, batteries, flashlights, sandbags, emergency kits, etc. Food, water and medicine were included in the emergency kits prepared by the respondents. Other short-term emergency measures included stocking up the supply of essentials and water, keeping valuables in water proof bags in the upper stories of their homes and buying a battery-powered radio. Long-term measures taken by them included shifting of storeroom and kitchen to upper stories of their homes, waterproofing of basements, building embankments around their houses and fields. Figure 3 can be observed that a considerably low percentage of respondents are covered by flood insurance. Despite living in high flood-risk zones, the residents have been indifferent towards opting for flood insurance.

The results indicate a serious dearth of flood preparation measures by the respondents. The findings oppose their perception of being prepared for floods. When asked whether they believe in making preparations against floods, 96.5% of the respondents replied 'Yes' and 4.4% 'No'.

Flood warnings and trust in officials and institutions

An essential component of preparedness is being acquainted with flood warning systems that will be used to disseminate timely warnings to end-users. The last part of the questionnaire dealt with the flood warning systems present in the area where the respondents lived. For evaluating and gauging public consciousness and knowledge about the availability and application of flood warning systems, they were asked to recall the sources which guided them during previous flood events.

Regarding EFWS, most respondents (78.5%) said that they were not aware of 'flood or extreme weather' warnings. Rest (21.5%) mentioned that they received warnings

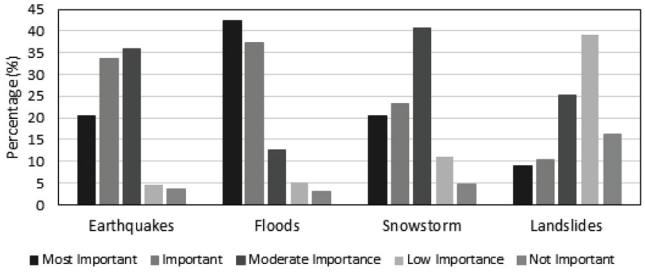

Figure 2. Rating of the importance of floods against other natural hazards.

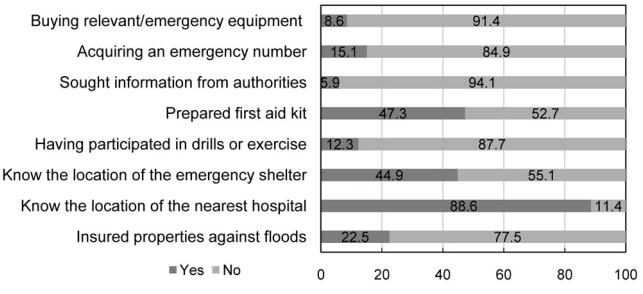

Figure 3. Distribution of responses concerning protective measures adopted by the participants.

Table 2. Correlation of respondents' profiles with their answers

Variable 1	Variable 2	*P*-value*	*r***	Chi-square value	Test
Age	Individual knowledge of floods	0.023	0.15		SR
	Individual knowledge of flood-protection measures	0.041	0.11		SR
	Importance of flood risk	0.016	0.23		SR
	Most important medium of warning	0.001			KW
Gender	Individual knowledge of flood-protection measures	0.005			MW
	Importance of flood risk	0.001			MW
	Likelihood of floods in the next 5 years	0.011			MW
Income	Importance of flood risk	0.015	0.33		SR
	Early warning awareness	0.002	0.25		SR
Past experience of floods	Individual knowledge of floods	0.011			MW
	Individual knowledge of flood-protection measures	0.000			MW
	Importance of flood risk	0.001			MW
	Likelihood of floods in the next 5 years	0.001			MW
	Having flood insurance	0.000		12.54	CS
Education level	Importance of flood risk	0.012	0.13		SR
	Likelihood of floods in the next 5 years	0.004	0.25		SR

*5% level of significance. **r, Spearman's rho. SR, Spearman's rho test; MW, Mann–Whitney U-test; KW, Kruskal–Wallis test; CS, Chi-square test of independence.

as a part of the weather forecast. Almost all respondents (96.8%) revealed that they had never received or read any information regarding flood risks, flood preparedness or flood protection. As far as the most important medium of receiving flood warnings is concerned, the respondents ranked radio and TV first (65.6%), followed by newspapers (16.3%), internet (9.5%), SMS (7.2%) and voicemail (1.4%).

With respect to trust on institutions or authorities for disseminating flood warnings, most participants showed low reliance in their responses. A total of 16.5% respondents recorded positive opinion about the adequacy of flood forecasts and warnings from concerned authorities, 13.5% said that the warnings and forecasts were 'adequate', while only 3% respondents said that these were 'very adequate'. Majority of respondents (38.8%) said that these were inadequate and 15.5% said that these were 'very inadequate'. Neutral replies were recorded by 29.2% of the respondents.

In response to the degree of trust in local authorities for safeguarding them against floods, the most common answer was low (53.9%), followed by average (28.8%) and very low (11.5%). More than 65% of the respondents had lower than average trust in the concerned authorities. Only 5.2% and 0.2% showed 'high' and 'very high' trust in the authorities respectively. People of the Valley have consistently shown their lack of trust in Government and local authorities for managing natural disasters[29].

Correlation of respondents' profiles with their answers

Several correlations were exhibited between the answers of the respondents and their individual characteristics, namely age, gender, income, occupation and previous experience of floods. Only some variables exhibited statistically significant correlations (Table 2). On the basis of their responses, older people tend to assess their risk knowledge as well as knowledge of actions to be taken in case of a flood emergency higher than younger people. For these two variables, Spearman's tests were statistically significant ($P = 0.023$ and $P = 0.041$ respectively). Flood risks were also rated higher by older respondents ($P = 0.016$). Finally, different age groups rated different means of receiving warnings differently ($P = 0.001$). However, the correlations of these variables with age were low (Table 2).

Regarding gender, males perceived a lower likelihood of floods in the near future than females (Table 2). The results are statistically significant ($P = 0.011$). Also, the assessment of knowledge of floods by males was more than females ($P = 0.005$). The importance of flood risks was rated higher by females than males ($P = 0.001$).

As far as the income of respondents is concerned, those earning less than INR 200,000 were more seemingly aware of early flood warnings than other income groups (Table 2). The results were statistically significant ($P = 0.015$). The lower income group also rated flood risk higher at a statistically significant level ($P = 0.002$).

Previous experience of floods showed statistically significant correlation with several factors (Table 2). Respondents with a previous flood experience assessed the likelihood of a flood in the near future to be higher ($P = 0.001$) and showed higher level of confidence in their knowledge about floods ($P = 0.011$) and the measures to be taken for flood protection ($P = 0.000$). More respondents having a previous flood experience tended to insure their properties against floods ($P = 0.000$).

The education level of the respondents was found to somewhat correlate to the importance of flood risk and how likely floods would occur in the near future (Table 2). On the basis of Spearman test, the respondents with higher education associated more importance to flood risk ($P = 0.012$) and more likelihood to the occurrence of floods in the near future ($P = 0.004$). Occupation of the respondents did not show significant correlations with any variable under study.

Discussion

The results show that the inhabitants across Kashmir Valley are more concerned about floods than other natural disasters. This is in spite of the fact that Kashmir Valley is one of the most active seismic zones of the Himalaya and experiences many small to moderate earthquakes compared to floods[30]. Respondents consider the recent increase in the incidence of floods as man-made, being a consequence of heedless human interventions[31]. Unprecedented increase in human activities and constructions along the floodplains together with encroachment of water bodies have worsened the situation. The carrying capacity of River Jhelum has decreased and wetlands have been reduced to a drastic extent. All these factors have led to apprehension of flooding in even those who were not affected by a previous flood[19].

While many respondents in the present study consider that there has been a significant increase in the number of flood incidences in the recent past, a large section of the surveyed population mentioned that there was no trend in the floods in their region. These people mostly inhabit the vulnerable flood plains of River Jhelum and its tributaries. Floods in these regions have been a common occurrence in the past and in recent times.

The respondents living in the floodplains were affected directly by previous floods. Their homes, fields, shops and properties were flooded and at many places even lives were lost. The respondents whose place of residence was not flooded mentioned that the previous floods disrupted their day-to-day lives. Traffic, trade and public services were severely hit. Communication networks and power supply remained dysfunctional for months. Hospitals were flooded and roads connecting them were also under water. Thus, floods had affected the people living in flood-prone as well as flood-safe regions to a significant level in the past.

In Kashmir Valley, there is serious lack of flood preparedness among people. Some insignificant steps have been taken by the inhabitants themselves, which are not sufficient for tackling a flood disaster. Well-structured policies, strategies and actions are absent, which further aggravates the flood situation. Also, the perception among majority of the population that floods are a punishment from God restricts the preparedness efforts. The people believe that it is futile to prepare for nature's fury unless they mend themselves on religious lines[19].

The overall negative disposition towards the concerned authorities for protecting individuals against floods may be attributed to low institutional trust, along with holding human intervention responsible for flood disasters. People also hold these institutions responsible for dearth of appropriate management of flood plains and flood channels[32]. The Government is also blamed for not carrying out necessary structural flood defence arrangements in the floodplains. As a result, communication of risks or information provided by the authorities fails to make the desired impact[33].

Most researches have reported a positive correlation of age with adopting protective measures against disasters[34,35]. This fits the overall perception that older people are more heedful towards the impending risk. However, the results of this study do not establish a correlation between age and taking protective measures. The study, however, shows that older people use their knowledge of floods and flood protection measures more than the younger people.

Females perceive the risk of disasters higher than males and worry more about them[36,37]. The results of this study are in line with the previous findings and suggest that females perceive flood risks differently compared to males. This would in turn determine the behaviour of the two genders in case of a flood[38].

Perception of risk among the respondents is highly affected by their economic status. In this study, low-income groups showed more risk awareness than high-income groups. Although high-income groups are at a risk of suffering greater monetary loss they are usually protected by insurance and it is easier for them to replace damaged property and lessen the flood effects[39].

With regard to previous experience of floods, the results of the study are in compliance with established studies. Respondents who have been affected by a past flood presumably expect that a flood would reoccur[40,41]. Therefore, the preparedness level and behaviour are higher, and they are more likely to implement flood mitigation measures. The level of education of the respondents did not show any relation with adopting preventive measures, knowledge of actions to be taken in case of a flood or even the level of trust in the Government or authorities for flood management[40,42]. There was, however, a positive correlation between education level and the likelihood of a future flood.

Risk perception and instant judgement during floods have a pivotal role in determining the safety of inhabitants. The respondents, however, admitted poor knowledge of floods, flood emergencies and mitigation measures in this study. Thus, there is a dire need of increasing flood awareness amongst the people, apart from implementing other flood management and mitigation measures.

Conclusion

Understanding public perception is an unusually crucial component in the risk communication of disasters, among Government, civil protection authorities and risk-zone inhabitants. This is particularly true for flood-prone areas, where disasters give limited opportunity for the officials to warn and evacuate civilians. Risk perception is vital as it reflects preparedness, emphasizes issues and guides future attempts at education and awareness. However, there is minimal knowledge on the public perception of flood risks in Kashmir Valley, as is reflected by the insufficient literature available on the topic.

This study provides an insight into the basics of a layperson's perception of flood risks and warnings in Kashmir Valley. The findings of the study are of significance to the region, which has historically witnessed many spates of disastrous floods and has a large fraction of the population living in the floodplains. The study shows that the inhabitants of various flood-prone areas of the Valley have little knowledge and awareness regarding floods, despite associating maximum importance to floods amongst various natural disasters. Preparedness amongst the respondents is extremely poor in terms of adopting protective measures, acquiring knowledge of floods, insuring against them and low awareness of flood warnings and information. Respondents also display a low trust level in the Government and various authorities responsible for issuing flood warnings and implementing flood prevention measures.

In view of the fact that floods cause many fatalities and immense damage to properties in Kashmir Valley, the findings of this study necessitate involvement of authorities for raising public awareness. People should be educated on flood risks and their mitigation by productive actions to improve their knowledge of floods. Awareness campaigns targeting all inhabitants need to be organized to exemplify the need taking individual protection measures against floods. These campaigns must also highlight the need for reading and understanding information by relevant authorities on flood preparedness and individual safety. Authorities need to improve their level of trust amongst the citizens. This can be achieved by involving citizens while drafting flood management policies and finally implementing them on ground. Also, the authorities need to develop more reliable flood forecasting and warning systems for the region, and improve the means and forms of warnings reaching the citizens. Overall, the study recommends the need for integrating the main findings of public risk perception in education and awareness plans as well as in mitigation and management plans.

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