ORIGINAL ARTICLE

Risk Perception and Emergency Preparedness Against Flood Affected Participants From the Primary Health Care Centre, Malaysia: A Comparison Between Genders

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ABSTRACT

Introduction: Flooding has become a major natural disaster in Malaysia in recent decades. There may be a gender difference in many aspects related to flood response and practice. This study aimed to examine the gender gap in knowledge, attitudes, and practice of flood preparedness in Malaysia. **Method:** This cross-sectional study was conducted among patients attending the primary care clinic at Universiti Sains Malaysia health campus, Kelantan. A validated questionnaire was used for data collection. **Results:** 328 subjects were recruited, 56.1% of them were females. The female respondents were younger than the males (36 vs. 41 years old). However, females have better knowledge, and practice on flood preparedness compared to male respondents. Among those, women were more aware of the local emergency plan than males (p=0.01). More female respondents kept their vaccination and personal medical records in a waterproof container or sealed plastic bag during past and future flood preparations (3-5 day supply of non-perishable food) than male respondents (p<0.05). In addition, with the practice of keeping a one-week supply of medication, and having their medical records in a waterproof container along with a first-aid kit (p=0.001). For future flood preparation, more women would filter the cloudy water through clean clothes for boiling (p=0.035). The determinants of good preparedness for future floods for female were older-age (p=0.001), blue-collar (p=0.043); whereas male were lower household income (p=0.014), being blue collar (0.014) and white collar (0.039) compared with student/retiree based on multivariate logistic regression. **Conclusion:** Our study reported that the determinants of good preparedness for future floods were older-age, blue-collar and having a lower-household income.

Malaysian Journal of Medicine and Health Sciences (2023) 19(4):8-14. doi:10.47836/mjmhs19.4.3

Keywords: Predictors, Gender difference, Flood, Preparedness, Malaysia

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INTRODUCTION

Malaysia is a tropical country located close to the equator; resulting in a hot and humid climate throughout the year (1). The weather and rainfall volume varies from place to place, influenced by the Northeastern and Southwest monsoon seasons (2). In recent years, unpredictable and variable monsoon rainfall patterns have led to severe and frequent flood disasters. Over the last decades, up to 90% of the catastrophic damage in Malaysia was due to floods (3). Flash floods have brought devastating consequences to people's lives and livelihoods (4). Recently, Malaysia witnessed one of its worst flooding

incidents in Dec 2021, caused by an overflow of rivers due to prolonged and heavy rainfall (5).

Community-level preparedness is a person-centred approach that is synergistic to disaster risk reduction. It would involve risk awareness and the ability to react and manage before and during a disaster (6). The United Nations' global survey reported that the dissemination of warnings and the preparedness to respond to floods were the weakest element of early warning systems (7). Therefore, this much-needed risk awareness would focus on preparing the public with pre-disaster initiatives and equipping them to tackle the devastating effect of natural calamities such as flood when it occurs. Usually, heavy rainfall about 2420 mm occurred in peninsular Malaysia (Kelantan, Johor, Pahang, Perak, Kuala Lumpur and Selangor) during November to February by Northeast monsoon wind and more intensity in the eastern part (2630 mm for Sabah and 3830 mm for Sarawak) of Malaysia (8, 9,10).

Depending on various social factors, an individual's preparedness against flash floods plays a vital role in disaster management (11). Socio-economic conditions could bring different outcomes for communities where the most vulnerable groups suffer. This is could be the people with low-income living in flood-prone areas as they are attracted by cheap housing and job accessibilities, which increased the risk of exposure to flooding to lower access to coping mechanisms that can support recovery (12). More floods in Malaysia lead people at risk of losing their livelihoods, incomes, and resources. The dependency ratio for each household was based on the level of education of the head person in their family (13). Patients attending the health clinic who routinely receive treatment during flood would exacerbate their medical conditions, this is mainly due to most of them do not have the habit to keep their medicine in the safe box and the medicine could be spoilt in the flood. Furthermore, the record coping could be spoilt and affected in the flood (13).

The difference between men and women is influenced by factors such as socio-economic conditions, skills and capabilities, social roles and responsibilities, and their traditional culture and beliefs (14,15). The inequality and insufficiency of gender-sensitive approaches during a disaster have become an important topic and have been increasingly emphasized. The World Health Organization (2002) stated that the inequality in gender in terms of their role and responsibility and decision-making in a household has led to the variation in the vulnerabilities between males and females when a flood strikes (16). In 2009, the United Nations introduced policies and guidelines on gender-sensitive disaster risk reduction to promote gender equality during disasters (17).

The recovery from flood disaster depends on the magnitude of the disaster, the country's preparedness, and the available resources (18). In disaster situations, participants are particularly vulnerable. The value of proactive engagement with persons suffering from medical co-morbidities in areas at risk has recently been brought to focus. The disruption of routine treatment during a disaster such as a flood would exacerbate their medical condition, potentially leading to disastrous health consequences (19). Despite an increasing interest in studying flood preparedness, participants' perception from a gender perspective is still poorly understood, and far too little attention has been paid to their social determinants. Considering these knowledge gaps, the study aims to determine the gender difference in future flood preparedness among participants visiting an outpatient clinic in Malaysia.

MATERIALS AND METHODS

Setting

We conducted a cross-sectional study in an outpatient clinic of a government tertiary teaching hospital for Universiti Sains Malaysia in Kubang Kerian, Kelantan. The clinic is located in Pengalan Chepa, within the Kota Bahru district, well known for the Kelantan River. Pengakalan Chepa is located in a district at moderate risk for flooding, as it is the estuary of Kelantan River (20). Over the decades, floods have frequently affected it, especially during the monsoon season. There are 48,714 residents in the surrounding area, with Malays being the predominant group. 10 Family Medicine Specialists and 20 vocational trainees in family medicine serve this primary care clinic.

Study Population

We targeted participants who attended this primary care clinic at least 18 years old and consented to participate. They were recruited from June to August 2015 via a convenient sampling method. Participants from all ethnicity were accepted. Exclusion criteria of the study included pregnant women, cognitively impaired individuals, AIDS/HIV and terminally ill individuals. Participants were informed regarding the objectives of the study using a patient information sheet. Written consent was obtained preceding data collection. The information obtained was kept confidential.

Using Epi Info 6, we calculated the sample size based on a prevalence of 54 % in a local study (21). The estimated sample size was 269 with 90% per cent power, 95% confidence interval and significant value <5%. The total sample needed was 336 after considering a non-response rate of 20%.

Questionnaire

We modified a pre-designed and pre-tested structured questionnaire from the Centre for Disease Control and Prevention (3) and distributed it to our study subjects to assess their knowledge, attitude, and practice about

preparedness for flood (22). A total of 43 questions were designated to weigh up the precautions and safety measures for all subjects during past and future floods. Social demographic data were obtained in the first section, including age, gender, race, marital status, highest education level, occupation, and household income. The practice during the previous flood was assessed in the second section of the questionnaire, which consisted of 11 items. The Cronbach's α value was 0.75. The median score was used as a cutoff point to decide poor practice (<5). A total of 25 items were asked in the second section to evaluate their future practice when they face flood warnings. The sum in this section was presumed as their preparedness for coming floods (Cronbach's α=0.80). A median score of 6 was used as a cutoff point to determine poor practice (<6).

Statistical analysis

We used mean, and standard deviation to describe continuous data with a normal distribution curve. On the other hand, if there was a skewed distribution curve, data were described using median, minimum, and maximum values. Categorical or dichotomous variables were analyzed using the Chi-square test or Fisher exact test, and it was reported using proportions (percentage). The independent variables were socio-demographic factors, including age, gender, race, marital status, highest education level, occupation, and household income. In contrast, the dependent variables comprised categories of knowledge and practices towards flood preparation. Clinically significant variables with a p-value below 0.25 in univariate analysis were included in multivariate logistic regression. Whether it was good or poor, the level of practice was the dependent variable.

In contrast, independent variables included gender, age, ethnicity, level of education, household income and marital status. 95% confidence intervals (CI) were used in the analysis, and a p-value of less than 0.05 was considered significant. The Statistical Package for Social Sciences (SPSS version 21) was used for statistical analysis.

Ethical Clearance

We gained ethical approval from the Human Research Ethics Committees of Universiti Putra Malaysia (FPSK (EXP15) P084), and obtained informed consent from all study participants.

RESULTS

A total of 328 participants participated in this study. The demographics of all participants are shown in Table I. Slightly more than half were women (56.1%, n=184), with only 43.9% (n=144) males. The overall mean age of the participants in this study was 39-years-old, with 36-years-old for the females and 41-years-old for the male participants. The majority of the study respondents were Malay (92.7%). The mean age is significantly different (p=0.006), household income (p=0.032) and blue-collar occupation (p<0.001) between male and female groups.

Table I: Gender difference in the socio-demographic background (n=328)

Profile	Female N (%)	Male N (%)	p-value
Age	36 (15)	41 (17)	0.006
Household income	1777 (1957)	2241 (1729)	0.032
Race			
Malay	173 (56.9)	131 (43.1)	
Non-Malay	11 (45.8)	13 (54.2)	0.293
Education level			
Primary	7 (53.8)	6 (46.2)	0.572
Secondary	87 (53.4)	76 (46.6)	
Tertiary	90 (59.2)	62 (40.8)	
Occupation			
Blue-collar	23 (31.9)	49 (68.1)	<0.001
White-collar	45 (52.3)	41 (47.7)	
Housewife/students/retiree	116 (68.2)	54 (31.8)	
Marital status			
Married	76 (61.8)	47 (38.2)	0.108
Single/Divorced/ widow	108 (5.7)	97 (67.1)	

p< 0.05 is significant

Table II demonstrates participants' responses on experiences in flood and future flood preparation according to gender. Based on their experience in flood, nearly half (49.7%; n=163) of the subjects would actively find out about the risk of flash flood and landslides of their home location. Almost three-fifths (61.3%; n=201) of the respondents were aware of their local community emergency plans. There was a significant difference in the awareness of the local community's emergency plans between female and male subjects (p=0.01). More than half of females tend to plan (58.6%) and practice (55.6%) flood evacuation routes with their families compared to the male participants.

Regarding future practice towards flood preparation, females practised better flood preparation than males, leading the majority in all aspects of the course. A significant number of females (61.7%; p=0.015) would keep their important documents in a waterproof, sealed container or plastic bag. Our study also found that females were more likely to keep a few days to a week's supply of non-perishable food (59.8%, p=0.005) and medication, along with medical records and first aid kits (61.6%, p=0.001). More than half of the female participants had good water and food safety practices. It was statistically significant with more females filtering cloudy water during a flood (59.1%, p=0.035).

Using univariate analysis, table III presented the association between participants' good practices towards flood preparation and socio-demographic factors. Table IV shows the predictors for good practice from

Table II: Responses of the participants on past-experiences in flood and future flood preparation according to gender (n=328)

No	Items	Female, n (%)	Male, n (%)	p-value
Previous experiences in a flood situation				
1.	You contacted the local authority to determine whether your home was located in a flash-flood-prone area or a landslide-prone area.	98 (60.1)	65(39.9)	0.144
2.	You were aware of your local community's emergency plans, like warning signals, evacuation route and location of emergency shelters	124(61.7)	77(38.3)	**0.010**
3.	You informed the nearest clinic about any special needs, i.e., elderly, bedridden or disabled person	82(57.7)	60(42.3)	0.599
4.	You had planned a flood evacuation route with your family	109(58.6)	77(41.4)	0.296
5.	You had practiced a flood evacuation route with your family	84(55.6)	67(44.4)	0.875
6.	You have an out-of-state relative or friend to be the "family contact" in case your family is separated during a flood	158(58.3)	113(41.7)	0.079
7.	You had made sure everyone in your family knew the name, address, and phone number of the contact person	166(57.8)	121(42.2)	0.093
8.	You had made sure everyone in your household had the emergency contact numbers in their handphones.	118(59.3)	81(40.7)	0.147
9.	You have had a fire extinguisher at home	36(51.4)	34(48.6)	0.375
10.	You have ensured all family members know how to use the fire extinguisher.	47(56.6)	36(43.4)	0.911
11.	You had a licensed electrician raise electric components, e.g., switches, sockets and wiring at least 1 foot above your home's projected flood elevation.	95(55.9)	75(44.1)	0.935
Future practice towards flood preparation: if you are under a flood watch or warning, you would				
1.	Place your immunization and personal medical records in a waterproof container or sealed plastic bag	119(61.7)	74(38.3)	**0.015**
2.	Prepare a basic first aid kit	112(60.5)	73(39.5)	0.065
3.	Fill up the containers, sinks and plastic bottles with clean water.	163(56.2)	127(43.8)	0.912
4.	Clean the sinks and pails first by using bleach before rinsing and filling with clean water	129(54.2)	109(45.8)	0.261
5.	Bring outdoor possessions such as furniture, bicycles and trash cans inside the house and tie them down securely	125(57.6)	92(42.4)	0.442
6.	Gather the emergency supplies you previously stocked in your home and stay tuned to community updates through radio or television or reliable social media sources	156(57.8)	114(42.2)	0.186
7.	Turn off all utilities at the main power switch and close the main gas valve if evacuation appears necessary.	155(56.2)	121(43.8)	0.959
8.	Keep several clean water containers, which is adequate for 3-5-days (about five gallons for each person).	150(58.8)	105(41.2)	0.063
9.	Keep a 3-5-day supply of non-perishable food, e.g., biscuit, or canned food, with a manual can opener	159(59.8)	107(40.2)	**0.005**
10.	Keep a 1-week supply of medication along with a personal medical record book in a waterproof container and a first aid kit	146(61.6)	91(38.4)	**0.001**
11.	Keep a battery-powered radio, flashlights, and extra batteries/ power bank	145(56.0)	114(44.0)	0.936
12.	Prepare sleeping bags or extra blankets.	124(58.8)	87(41.2)	0.191
13.	Prepare adequate baby food, formula milk and diapers	115(59.9)	77(40.1)	0.100
14.	Prepare disposable "baby wipes" for the whole family to use if bathing facilities are not available.	108(58.4)	77(41.6)	0.344
15.	Prepare personal hygiene supplies, such as soap, toothpaste, or sanitary napkins	172(56.0)	135(44.0)	0.921
16.	Prepare an emergency kit for the car with food, flares, jumper cables, maps, tools, fire extinguisher, sleeping bags, etc.	95(56.9)	72(43.1)	0.769
17.	Prepare rubber boots, sturdy shoes, and waterproof gloves.	103(56.0)	61(44.0)	0.961
18.	Prepare insect repellent, sleeping net, long-sleeved and long-legged clothing for protection	142(58.2)	102(41.8)	0.192
Future practice towards flood preparation on safety issues during the flood				
1.	You will use bottled water that has not been exposed to flood-waters.	172(57.7)	126(42.3)	0.062
2.	If you do not have bottled water, you will boil water to make it safe.	172(56.4)	133(43.6)	0.694
3.	If the water is cloudy, you will filter it through clean cloths or allow it to settle and draw off the clear water for boiling.	153(59.1)	106(40.9)	**0.035**
4.	You will boil the water for one minute, let it cool, and store it in clean containers with covers.	168(56.9)	127(43.1)	0.353
5.	You will not eat any food that may have come into contact with floodwater.	172 (57.0)	130(43.0)	0.287
6.	You will discard any food with screwed caps, snap lids, pull tops, crimped caps, cardboard juice/milk/baby formula boxes, and home-canned foods that were not in a waterproof container if it has any chance to come into contact with floodwater.	155 (56.6)	119(43.4)	0.698
7.	You will inspect canned foods and discard any food in damaged cans.	161 (56.1)	126(43.9)	1.000

Table III: Association between participants with good practice towards flood preparation and socio-demographic factors using univariate analysis (n=328)

Profile	Female			Male		
	Poor practice	Good practice	p-value	Poor practice	Good practice	p-value
Age	33 (13)	41 (17)	<0.001	40 (17)	43 (17)	0.263
Household income	1827 (2375)	1730 (147)	0.749	2639 (2046)	1951 (1401)	0.032
Race						
Malay	88 (50.9)	85 (49.1)	0.813	56 (42.7)	75 (57.3)	0.765
Non-Malay	6 (54.5)	5 (45.5)		5 (38.5)	8 (61.5)	
Education level						
Primary/Secondary	47 (50.0)	47 (50.0)	0.763	33 (40.2)	49 (59.8)	0.554
Tertiary	47 (52.2)	43 (47.8)		28 (45.2)	34 (54.8)	
Occupation						
Blue-collar	8 (34.8)	15 (65.2)	0.231	15 (30.6)	34 (69.4)	0.033
White-collar	23 (51.1)	22 (48.9)		16 (39.0)	25 (61.0)	
Housewife/students/retiree	63 (54.3)	53 (45.7)		30 (55.6)	24 (44.4)	
Marital status						
Married	43 (56.6)	33 (43.4)	0.211	19 (40.4)	28 (59.6)	0.744
Single/Divorced/ widow	51 (47.2)	57 (52.8)		42 (43.3)	55 (56.7)	

Table IV: Predictors of good practice in the previous flood experience using multiple logistic regression (n=328)

Female				Male			
Variables	**Exp (B)**	**95% CI**	**p-value**		**Exp (B)**	**95% CI**	**p-value**
Age	1.049	1.021,1077	0.001	Income	1.001	0.999, 1.000	0.014
Occupation Category			0.121	Occupation Category			0.029
Blue-collar	2.758	1.030,7.383	0.043	Blue-collar	2.965	1.242,7.078	0.014
White-collar	1.343	0.648,2.785	0.427	White-collar	2.693	1.05,6.909	0.039
Housewife/student/retiree	1			student/retiree	1		
Marital status: non-married	0.702	0.317,1.556	0.384				
Married	1						

previous flood experiences. The occupational category of blue-collar proved to be a significant predictor in both genders (p-value in female=0.043; p-value in male=0.014). Other predictors in the male population included lower household income (p=0.014) and white-collar occupation (p=0.039). While among females, older age was the predictor for having good practice following previous flood experience (p=0.001).

DISCUSSION

In this study, female participants were better prepared to face flood situations than male participants. Females were more aware of the consequences of flooding, which was in line with the previous report by O'Neill et al., who viewed females as more stressed over expected flooding (23). Cultural determinants also play a part in risk preparedness and awareness among women. Women are more willing to adopt preventive measures from authorities and are more likely to evacuate during a disaster than men due to higher perceived risk and gender differences in caregiving (14, 24, 25). The results are consistent with the finding by Roder et Al. reported that women in Taiwan also have higher preparedness levels when thinking of possible future hazards (26). In general, preparedness for floods has been positively associated with previous experience and awareness (27). Some researchers have reported that men are more confident in their preparedness level, with a better ability to respond and manage during a disaster (14, 28, 29). This could be explained by the fact that men were educated in management during emergencies during military service in some countries (9).

Females who planned and practiced evacuation routes with their families kept the crucial documents from getting wet. This might be due to the better organization skills of women, who are also concerned about essential supplies and important documents. These results align with a previous report by Cvetković et al., 2018 where women had an implanted feeling of focusing on the household's security, which motivated them to arrange and manage household and family concerns (14). Women generally had more realistic views of ensuring the safety of food and water consumed during floods. This is supported by the previous reports, which found

that female participants perceived flood risk more acutely than their male counterparts (30, 31).

The results from the current study reported a strong association between age and good practice towards flood preparedness in females. This is consistent with other studies' finding that a household's preparedness for a disaster is significantly associated with older age (32, 33). This could be explained by the older participants could use their previous knowledge of the vulnerable area during the flood to prepare household supplies to survive before and after the disaster.

Blue-collar workers, regardless of gender, were also found to be significantly associated with good practices based on previous flood experience. This agreed with a study from Japan, which revealed that those from blue-collar groups, like farming-related jobs, were significantly associated with better community preparedness (33).

The risk perception of the study participants influences their disaster preparedness. Our study showed that those with lower household incomes were predictors of good practice towards flood among the male population. A previous study showed that participants confronted a similar degree of vulnerability from a flood regardless of high or low income; however, the low-income victims were affected and suffered more (21). This result agrees that disaster preparedness positively correlation with increased concern for the risks involved. Thus, this explains why low-income people were willing to adopt preventive measures and better understand good practices in preparing for future flood situations.

The implication of this study was that assessing the differences in perception between males and females would help policymakers recognize the population's capacities and provide better prospects to face future flood-related disasters.

Strengths and limitations of the study

This is the first study to assess the gender difference in flood preparedness with a relatively big sample size (n=328). This study has some limitations. First, the survey was conducted in a single centre from the health campus of Universiti Sains Malaysia health in Kelantan, and the finding only applied to this area. Secondly, convenience sampling in this study could pose a potential bias in the results. Thus, we need to interpret the results of this study cautiously within the context of its limitations. We recommend including more centres to be included in a future Malaysian study.

CONCLUSION

Our results showed that females were more aware of good practices, precautions and safety interventions toward flood preparation. Our study results conclude that female participants, especially those older and blue-collar, generally had a better approach towards flood preparedness. Among the male population, those with lower household income and those from the blue and white collared background were the determinants of good practice toward the flood. Policymakers should pay attention to the male population during future flood prevention education programs.

ACKNOWLEDGEMENTS

The authors like to acknowledge all the participants who participated in this study. Author received funding source from Fundamental Research Grant Scheme: FRGS/1/2015/SKK07/UPM/02/2/10337, Malaysia.

REFERENCES

1. Tang KHD. Climate change in Malaysia: Trends, contributors, impacts, mitigation and adaptations. Sci Total Environ. 2019;650 (Pt 2): 1858-71. doi:10.1016/j.scitoten v.2018.09.316.
2. Nurul Afzan MH. The peninsular Malaysia flooding-a spatio-temporal analysis of precipitation records. Perpustakaan UMP: Universiti Malaysia Pahang 2014. https://core.ac.uk/download/159184655.pdf. Accessed 21 August 2022.
3. Dorasamy M, Raman M, Muthaiyah S, Kaliannan M. Disaster Preparedness in Malaysia: An Exploratory Study. Recent advances in management, marketing, finances: WSEAS Press; 2007.
4. Petersen MS. Impacts of Flash Floods. In: Gruntfest E, Handmer J, editors. Coping With Flash Floods. Dordrecht: Springer Netherlands; 2001. p. 11-3.
5. Reuters. Thousands displaced by floods in Malaysia 2021. https://www.reuters.com/markets/commodities/thousands-malaysia-displaced-after-non-stop-rainfall-2021-12-18/ Accessed 23rd july 2022 2021.
6. Terpstra T, Lindell MK, Gutteling JM. Does Communicating (Flood) Risk Affect (Flood) Risk Perceptions? Results of a Quasi-Experimental Study. Risk Anal. 2009;29(8):1141-55. doi: 10.1111/j.1539-6924.2009.01252.x.
7. Basher R. Global early warning systems for natural hazards: systematic and people-centred. Philos Trans A Math Phys Eng Sci. 2006;364(1845):2167-82. doi: 10.1098/rsta.2006.1819.
8. Suhaila J, Deni SM, Zin WW, Jemain AA. Trends in peninsular Malaysia rainfall data during the southwest monsoon and northeast monsoon seasons: 1975–2004. Sains Malaysiana. 2010; 39(4):533-42.
9. Chan NW. Impacts of disasters and disaster risk management in Malaysia: The case of floods. InResilience and recovery in Asian disasters 2015 (pp. 239-265). Springer, Tokyo.
10. Khalid MS, Shafiai SB. Flood disaster management in Malaysia: An evaluation of the effectiveness flood delivery system. IJSSHS. 2015; 1;5(4):398.

doi: 10.7763/IJSSH.2015.V5.488
11. Wisner B, Blaikie P, Cannon T, Davis I. At risk: natural hazards, people's vulnerability and disasters (2nd ed): Routledge; 2014.
12. Hallegatte S, Fay M, Barbier EB. Poverty and climate change: Introduction. Environ Dev Econ. 2018;23(3):217-33. doi: 10.1017/S1355770X18000141
13. Nurul Ashikin A, Nor Diana MI, Siwar C, Alam MM, Yasar M. Community Preparation and Vulnerability Indices for Floods in Pahang State of Malaysia. Land. 2021;10(2):198. doi: 10.31219/osf.io/4xyaj
14. Cvetković VM, Roder G, Llcal A, Tarolli P, Dragićević S. The Role of Gender in Preparedness and Response Behaviors towards Flood Risk in Serbia. Int J Environ Res Public Health. 2018;15(12). doi: 10.3390/ijerph15122761.
15. Robles C. Gender Equality and Women's Empowerment in Disaster Recovery, World Bank Group. https://policycommons.net/artifacts/1271747/gender-equality-and-womens-empowerment-in-disaster-recovery/1855233/. Accessed on 24 Jul 2022.
16. World Health Organization. Gender and health in disasters. World Health Organization. https://apps.who.int/iris/handle/10665/68886. 2002. Accesed on 23rd Jul 2022.
17. United Nations, UNISDR, UNDP, ISDR. Making Disaster Risk Reduction Gender Sensitive: Policy and Practical Guidelines. http://repo.floodalliance.net/jspui/handle /44111/1124. 2009. Accessed on 23rd July 2022.
18. Sena L, Woldemichael K. Disaster prevention and preparedness. Ethopia Public Heal Train Initiat. 2006;1:1-80.
19. World Health Organization Regional Office for Europe. Flooding: managing health risks in the WHO European Region. World Health Organization. Regional Office for Europe. https://apps.who.int/iris/handle/10665/329518. 2017. Accessed on 23rd July 2022.
20. Abdullah S, Lee DJ, Fong SY, Ismail M. Particulate matter (pm10) analysis during pre-and post-flood event. Int J Civ Eng Technol. 2019; 10, (05), 788-796.
21. Safiah Yusmah MY, Bracken LJ, Sahdan Z, Norhaslina H, Melasutra MD, Ghaffarianhoseini A, Sumiliana S, Shereen Farisha AS. Understanding urban flood vulnerability and resilience: a case study of Kuantan, Pahang, Malaysia. Natural Hazards. 2020;101(2):551-71. doi: 10.1007/s11069-020-03885-1
22. Cyr JFS. At risk: Natural hazards, people's vulnerability, and disasters. J Homel Secur Emerg Manag. 2005;2(2). doi:10.2202/1547-7355.1131.
23. O'Neill E, Brereton F, Shahumyan H, Clinch JP. The Impact of Perceived Flood Exposure on Flood-Risk Perception: The Role of Distance. Risk Anal. 2016;36(11):2158-86.doi: 10.1111/risa.12597.
24. Bateman JM, Edwards B. Gender and evacuation: A closer look at why women are more likely to evacuate for hurricanes. Nat Hazards Rev. 2002;3(3):107-17. doi: 10.1061/(ASCE)1527-6988(2002)3:3(107).
25. Motoyoshi T. Public perception of flood risk and community-based disaster preparedness. In: Eds. SI, T. Fukuzono, and T. Sato, , editor. A better integrated management of disaster risks: Toward resilient society to emerging disaster risks in mega-cities: TERRAPUB and NIED; 2006. p. 121-34.
26. Roder G, Ruljigaljig T, Lin C-W, Tarolli P. Natural hazards knowledge and risk perception of Wujie indigenous community in Taiwan. Nat Hazards. 2016;81(1):641-62. doi:10.1016/j.ijdrr.2013.10.006.
27. Lechowska E. What determines flood risk perception? A review of factors of flood risk perception and relations between its basic elements. Nat Hazards. 2018;94(3):1341-66. doi:10.1007/s11069-018-3480-z
28. Armaş I, Avram E. Perception of flood risk in Danube Delta, Romania. Nat Hazards. 2009;50(2):269-87. doi:10.1111/j.1539-6924.2006.00810.x
29. Miceli R, Sotgiu I, Settanni M. Disaster preparedness and perception of flood risk: A study in an alpine valley in Italy. J Environ Psychol. 2008;28(2):164-73. 10.1016/j.jenvp.2007.10.006.
30. Ho M-C, Shaw D, Lin S, Chiu Y-C. How Do Disaster Characteristics Influence Risk Perception? Risk Anal. 2008;28(3):635-43. doi.org/10.1111/j.1539-6924.2008.01040.x
31. Lindell MK, Hwang Seong N. Households' Perceived Personal Risk and Responses in a Multihazard Environment. Risk Anal. 2008;28(2):539-56. doi:10.1111/j.1539-6924.2008.01032.x
32. Kirschenbaum A. Disaster Preparedness: A Conceptual and Empirical Reevaluation. Int J Mass Emerg Disasters. 2002;20(1):5-28. doi: 10.1177/028072700202000101
33. Tomio J, Sato H, Matsuda Y, Koga T, Mizumura H. Household and community disaster preparedness in Japanese provincial city: A population-based household survey. Annu Rev Anthropol. 2014; 4, 68-77. doi: 10.4236/aa.2014.42010.