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# Development of an adolescent coping model in seasonal flood-prone areas: a qualitative feasibility study

**Original article**

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**Abstract:** **Objective:** The aim is to develop and verify the feasibility of an adolescent coping model in seasonal flood-prone areas. This coping model supports mental health nurses' practical application to adolescents in flood-prone areas.
**Methods:** We developed the adolescent coping model based on the processes established in three integrated theories: self-care management for vulnerable populations, coping approaches, and coping with disaster. We conducted semi-structured interviews with 15 participants to explore their perspectives and experiences with flood disasters. We used purposeful sampling for maximum diversity. Data were collected through face-to-face, in-depth interviews. Data were transcribed verbatim, followed by qualitative content analysis. The coping model of adolescents in flood-prone areas was analyzed qualitatively and inductively from the viewpoint of acceptability.
**Results:** The following five categories were identified: (1) coping process post-disaster; (2) coping approach; (3) community power; (4) vulnerability; and (5) self-potential. These domains formed a model for coping model adolescents in seasonal flood-prone areas. Accordingly, our findings showed that the model could be practical for mental health community nursing.
**Conclusions:** Mental health nurses can use the coping model for disaster mental health nursing in adolescents in flood-prone areas. The application of this model will help adolescents increase self-efficacy.

**Keywords:** *adolescent • coping • feasibility study • nursing • seasonal flood-prone area • self-efficacy • qualitative study*



## 1. Introduction

Natural disasters are stressful events identified as significant risk factors for the emotional state of adolescents. Youths experiencing high exposure to disasters had the highest mean life stressors.[1] Annually, over 100 million young people are affected by disasters. Adolescents are more vulnerable to the negative impact of disasters than older adults.[2]

Floods are the most frequent natural disaster in Indonesia in the past 50 years. More people are affected by floods every year than other disasters and are the second deadliest disaster after earthquakes and tsunamis.[3] Floods occurring in Indonesia are generally caused by heavy rains, land conversions, river channel construction errors, river silting, and coastal flooding.

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The intensity of rain in Indonesia is increasing every year. Compared to other countries, Indonesia encounters floods frequently.[4] Indonesia ranks sixth among the world's most vulnerable countries to the risk of flooding.[5] Similar to other middle-income countries, Indonesia focuses little on vulnerable populations.

Floods are among the most common natural disasters that cause physical and economic impacts, which may trigger a wide range of mental health problems.[6] Flood disasters result in loss of life and property damage without proper protective coping behavior. Appropriate protective coping behavior is a process of adjustment to avoid or mitigate the adverse effects of flooding.[7] Children and adolescents are among the most vulnerable to mental health after disasters because they have less experience and knowledge of coping with them.[8] The Sendai Framework for Disaster Risk Reduction reduces deaths and the number of affected people. It is vital to increase community resilience to geohydrological hazards.[9]

Literature reviews have been used to identify a practical model to support the mental health of disaster survivors. The conceptual framework disaster reintegration model described supports individual-level resilience, promotes psychological health, physical health, and problem-solving ability, and reassesses the meaning of life discovered.[10] This study shows how to manage emotional reactions related to the disaster experience and promote healthy living. The other study focuses on the roles of protective factors on the psychological impact. Protective factors such as peer social support, school connectedness, supportive parenting, problem-solving, self-regulation skills, and perceived self-efficacy can buffer the psychological impact of disasters.[8] This study requires further work to identify a model for coping with adolescents in a seasonal flood-prone area.

Qualitative research methods are well suited to discover emergent concepts or determine the meaning of a phenomenon.[11] Further work is required to identify a coping model that is operational and applicable to mental health nurses. This study aims to construct a conceptual practice-based model for coping with rising adolescents' self-efficacy by integrating theories and interviewing adolescents. This model would enable nurses in various contexts to apply practical coping models, increasing adolescents' self-efficacy in their practice. This practical model will be a foundation for practice, research, education, and policy.

## 1.1. Description of the development of adolescent coping models in flood-prone areas

Researchers describe the adolescent coping model in flood-prone areas by integrating the theory of disaster coping process, self-care management for vulnerable populations, and model of coping. This model was administered to adolescents in disaster-prone areas by community mental health nurses. The draft version of the framework is described based on the disaster coping process, middle-range theory of self-care management for vulnerable populations, and model of coping.

## 1.2. Theory of self-care management for vulnerable populations (Jenerette, Coretta M; Murdaugh, 2003)

Vulnerability and vulnerable populations are essential concepts in healthcare systems. Vulnerable populations are social groups that experience health inequalities due to a lack of resources and increased risk exposure. Self-care management theory for vulnerable populations is an approach that aims to identify various variables that affect self-care management, health status, and quality of life of populations experiencing health changes. The central concepts in the model are contextual factors, vulnerability, and intrapersonal factors. The contextual factors are community values and community resources. The vulnerabilities are modifiable factors and non-modifiable factors. The intrapersonal factors are assertiveness, coping behavior, knowledge, self-efficacy, and social support.

## 1.3. Theoretical model of coping (Johansson & Hildingh, 2017)

There are six concepts of coping approaches. A composure based on perceived self-control was characterized by mastering. Individuals with mastering approach coping grew to control and gain confidence over the situation. They have an optimal way of coping. The *alleviating* approach to coping was characterized by distraction, verbalization, communication, and creating hopes to help the overwhelming and chaotic situation. The *volunteering* approach to coping was characterized by considering it a matter of course that they should participate, but the commitment was limited. The *acquiescing* approach was characterized by enduring the situation and redefining it to cope, even if it means having to relinquish mental and physical well-being. The *sacrificing* approach to coping was characterized by conflicting interests, affected mood in a negative, diffused pain and muscle tension, suffering, and mental and physical exhaustion. The *preoccupying* approach was characterized by constantly dwelling upon their feelings. They were very vulnerable and experienced agitated emotions, withdrawal, and being burdened.

### 1.4. Teories on disaster coping process (Lazarus Richard S and Folkman, 1984)

Sources of coping include health, positive beliefs, problem-solving skills, social skills, social support, and material sources. The three concepts of the disaster coping process are anticipation, impact, and post-impact.

(1) The period of anticipation is when something has not happened yet, and the most critical issue is to assess whether and when it will happen. The cognitive assessment process will also evaluate how individuals will manage threats and how an assessment process related to the sense of control occurs, such as whether the floods can be prevented, how to prevent them, what are the necessary steps to minimize or prevent damage, what damage can be prevented, or what damage cannot be prevented. This is called anticipatory coping. This later makes the individual use coping strategies, whether to stay away psychologically, avoid threats, reject or seek relevant information, or respond in action.
(2) During the impact period, the individual's thoughts and actions relevant to self-control are ineffective. Individuals begin to realize it as bad as or worse than they had anticipated. Disaster situations make the mind very focused on action and reaction, so it takes a long time to sort out what has happened and to find the event's meaning. This situation will make the individual reassess the meaning of the situation, which is called reappraisal cognition or redefinition of the situation. Cognitive processes during the impact period can persist into the post-impact period, even though this period is a phase of defining situations related to threats, demands, and challenges.
(3) After the disaster ends, the coping strategy aims at things that have passed or are currently happening and for the following procedures. Individuals discover the reality of what is happening and what indirectly affects coping. If they cannot control the situation, they will use a strategy by focusing on emotions or an effective method by focusing on the problem. The post-impact phase should have individuals make new settings for the anticipation process.

The conceptual framework for the development of the coping model theory was created by integrating the coping model theory of Johansson et al.,[12] self-care management theory of Dorsey and Murdaugh[13] for vulnerable populations, and disaster coping process theory of Lazarus Richard and Folkman.[14]

The process of integrating the three theories into a coping model is as follows. The first process is to conduct a literature study of research results with keywords such as "adolescence," "flood," and "mental health." As a result, flood victims can experience long-term psychological problems if not identified and treated early.[15] The stress experienced during a flood is caused by having to leave the house, feeling isolated when surviving in a flood location, and lack of sleep. The stress of the post-flood recovery period is related to the uncertainty of obtaining assistance, requiring more guidance regarding rebuilding, relocating, and flood mitigation guidance.[16]

The second process is to conduct a literature study related to middle-range nursing theory by adding keywords such as "coping," "self-efficacy," "children/adolescents," and "vulnerable groups." Researchers found the coping approach model,[12] the disaster coping theory,[14] and the theory of self-care management for vulnerable populations.[13]

The final process is to integrate the existing concepts based on the three theories through the following stages of theoretical analysis: (1) determining the origin of the theory, (2) testing the meaning, (3) analyzing logical adequacy, (4) determining usefulness, (5) explaining the level of generalization and parsimony abilities, and (6) determining the testability of a theory.[17] The coping model was prepared based on the analysis process to connect to other concepts and find causality, correlation, and interaction of the three theories (Figure 1).

## 2. Methods

### 2.1. Design

Feasibility studies can determine the practicality of conducting interventions that can be evaluated using face-to-face interviews. In addition, the feasibility of interventions can be evaluated from the point of view of the nursing model, intervention, and patients.[18] The current study uses a qualitative method to evaluate the proposed model. This design was chosen to guide the feasibility goal for future pilot trials. This study qualitatively analyzed data to explore and provide an in-depth understanding of adolescents' experiences in flood disasters.

### 2.2. Participants

The sample size for feasibility testing must be considered. The number of samples of <10 participants is sufficient to evaluate the acceptance, process, and practicality of the research.[18] The minimum sample size for a pilot study is 8–10.[19,20] The current study will

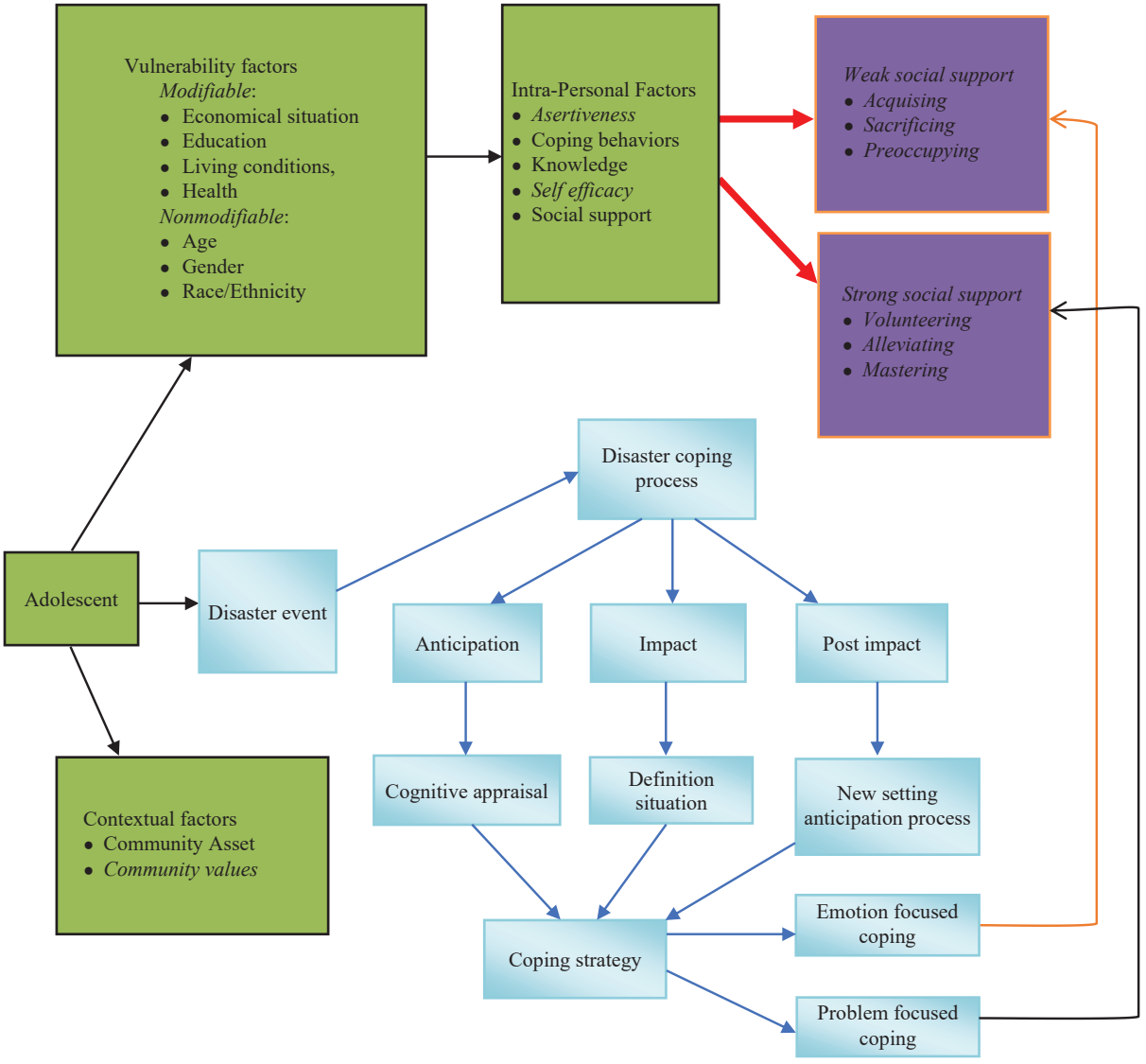


**Figure 1.** The development of a coping model for children in flood-prone areas uses the self-care management theory approach of Dorsey and Murdaugh (2003) for vulnerable populations, Johansson et al.'s[12] coping approach, and Lazarus and Folkman's[14] disaster coping process.

include a minimum of 10 participants as our goal is to evaluate the feasibility of the adolescent coping model in adolescents living in flood-prone areas from a teenage perspective.

## 2.3. Recruitment

A purposive sampling was selected for the development of an adolescent coping model, with the participants living in flood-prone areas. Participants were recruited by researchers involving health cadres in the study area. Disaster mental nursing experts, child nursing experts, and disaster experts are also involved in evaluating the post-drafting model based on the results of in-depth interviews. Participants' inclusion criteria are as follows: 13–18 years old, able to speak Indonesian, live and attend school in flood-prone areas, have experienced flooding, and have permission from parents to participate in research activities.

## 2.4. Acceptability

Acceptability can be determined through content based on the results of in-depth interviews with adolescents, and discussions of the results of mental nursing experts, child nursing experts, and disaster experts.

## 2.5. Data collection

Qualitative data were collected by conducting individual semi-structured interviews. Face-to-face interviews were audio-recorded and transcribed. Interviews were conducted with teenagers for 30–60 min to fit the model framework created based on theory. The data were collected from April 2021 to September 2021. Each interview was conducted face-to-face in a safe place where the participants felt comfortable. In-depth interviews were initiated by asking the participant: "Please tell me about your experiences in flooding." Then, participants were encouraged to talk in detail about their experiences. All interviews were recorded, and the recordings were immediately transcribed. Expert consultation on the model is carried out for 45–60 min based on the expertise of each expert.

## 2.6. Data analysis

Transcripts regarding field findings were analyzed using the content analysis method.[21] The analytical process included the following steps: (1) each transcript was read, after which feasibility descriptions from the text were extracted in meaning units; (2) meaning units were used to shorten the sentence into simple phrases and create a code so that the meaning is not lost; (3) similar codes were grouped, and subcategories were created; and (4) subcategories with similar content were collected and structured into categories.

## 2.7. Ethical considerations

This research was conducted based on the principles of the Declaration of Helsinki and the Indonesian ethics for medical health research involving human subjects. The research was approved by the ethics review board of the Faculty of Nursing Universitas Indonesia (IRB approval number: Ket-179/UN2.F12.D1.2.1/PPM 2021). Using the informed consent form for parents, the aim, procedures, and potential risks and benefits were explained to each eligible informant. Confidentiality and anonymity were assured. All data were kept in a secure file.

# 3. Results

## 3.1. Participant characteristics

A total of 15 participants living in disaster-prone areas participated in the research. Of these participants, 10 were female. All participants have experienced flooding more than twice and lived with families in ancestral lands. Table 1 describes the characteristics of the participants.

| ID | Gender | Age (years) |
|---|---|---|
| P1 | M | 16 |
| P2 | F | 17 |
| P3 | F | 17 |
| P4 | F | 15 |
| P5 | F | 16 |
| P6 | M | 14 |
| P7 | F | 15 |
| P8 | M | 18 |
| P9 | F | 13 |
| P10 | F | 13 |
| P11 | F | 15 |
| P12 | F | 13 |
| P13 | M | 14 |
| P14 | F | 17 |
| P15 | M | 16 |

*Note*: F, Female; M, Male.

**Table 1.** Characteristics of the participants.

The interview data regarding participants' experiences in seasonal flood-prone areas were categorized, analyzed by semantic units, and grouped based on similar experiences. From the interview data, 29 subcategories and 5 categories provided a practical framework regarding the coping model framework, contents of vulnerability, contextual, and intrapersonal factors, and coping (Table 2).

## 3.2. Coping process post-disaster

### *3.2.1. Emotion-focused coping*

This includes (1) feeling uneasy and uncomfortable during a flood and (2) feelings of anxiety, sadness, and fear of having a place to live that floods easily.

> *It is not good because it often gets flooded. When the flood can not be free to go anywhere. The problem is that it is hard for vehicles to pass, so it is boring to stay home … (P2)*

> *Sad when it floods because the house enters dirty water and lots of garbage. Immediately you can imagine the tiredness after the flood, the tiring cleaning … (P3)*

> *It is easy to worry when it is rainy season. We are afraid that it will suddenly flood even though we are not ready yet. Especially if it rains at night so we cannot sleep … (P5)*

| Category | Subcategory |
|---|---|
| Coping process post-disaster | Uncomfortable feeling of having a place to live floods easily |
| | Feelings of anxiety about having a place to live that is prone to flooding |
| | Help parents to evacuate goods at home |
| | Post-flood community service |
| Coping approach | Surrender without effort to the existing situation |
| | Let feelings of sadness go away on their own |
| | Trying to bear the problem alone |
| | Positive activities to divert problems |
| Community power | Cooperation between citizens |
| | Togetherness |
| | General thoughts |
| | Always the same situation |
| Vulnerability | Physical and psychological health problems |
| | Limited sources of income |
| | The environment is prone to flooding because it is near a river |
| | Educational level |
| | Inherent characteristics |
| Self-potential | Know the causes of flooding |
| | Know how to prevent flooding |
| | Know what to do during a flood |
| | Able to express opinions about living conditions |
| | State what is the right |
| | Focus on the problem |
| | Focus on emotions |
| | Face the challenges as much as possible |
| | Carry out obligations according to circumstances |
| | Confidence in yourself based on previous experience |
| | Parents provide support |
| | Support from neighbors and religious leaders |

**Table 2.** Content analysis: adolescents' experiences in seasonal flood-prone areas.

### 3.2.2. Problem-focused coping

This includes (1) helping parents evacuate things at home during a flood (cleaning, picking up, and securing items) and (2) community service after the flood.

*Help the family tidy up the things upstairs so they do not get wet. Then when the water has receded, they clean up the house from the garbage and the mud that gets in … (P1)*

*Hurry up and get things up so you don't get submerged in flood. Continue to survive at the top with the family … (P8)*

*After the flood cleans the house from trash, the mud that comes in. In the mandatory event, all family members who, if not participated can be scolded … (P11)*

*Help parents clean the house when the flood has receded, throwing trash, mud and brush walls because the house is filthy … (P12)*

## 3.3. Coping approach

### 3.3.1. Ineffective coping

This includes (1) letting it be without effort to the existing situation where participants revealed that when floods came, they were waiting for the flood to subside and did nothing and (2) letting feelings of sadness disappear alone where participants revealed not doing anything and being silent when sad.

*Not doing anything when I feel sad, just left until it disappears alone … (P1)*

*There is nothing we can do when floods, just sitting waiting for the flood to stop … (P5)*

*Nothing can be done. Silence waiting for fate … (P13)*

*Sad … but let it also disappear alone later … (P14)*

### 3.3.2. Effective coping

This includes (1) trying to bear the problems so as not to be a burden to parents and (2) trying to divert the problem felt by praying, playing with friends, gathering with family, and greeting each other with neighbors.

*I try to solve my problem because if I tell the teacher or the parents, it also burdens them. (P1)*

*With prayers to be more able to accept the conditions experienced, trying strong because of those who experience all who live here. (P5)*

*Being happy by playing floods with friends. Gather with family, greet each other with neighbours who are both experiencing a disaster. (P6)*

*Look for activities that can be done, like playing cellphones. However, playing on cell phones also can be short because if the battery runs out, it cannot be charged. After all, the electricity dies …*

*I like to go to the highway after school helping the family because you can't sell, so I want to help push the car,*

*help park it is pretty much to get money or deliberately the way people who want to give donations when the flood can be quite rice wrapped … (P8)*

## 3.4. Community power

### *3.4.1. Community cohesiveness*

This includes (1) cooperation between residents through community service with family and mutual environmental assistance and (2) togetherness manifested when the flood does not evacuate. Sharing responsibilities within the family and the environment to work together to clean the house and the environment after the flood, communicating with each other when assistance is available.

*Community work with all family members after the flood. All family members are involved. After finishing helping everyone in this area, no one fled during the flood. (P12)*

*There is togetherness with neighbours because no one has fled. We can still greet each other even though we have to shout from house to neighbour's house. (P13)*

*There are youth organizations that are active when there is a flood to help residents affected by the floods. (P14)*

*If there is assistance from outside, for example, packaged rice or groceries, it is communicated to other residents so that everyone can get it. (P15)*

Values or beliefs persist in living in flood-prone areas because they are ancestral lands, floods do not occur daily and the flood situation will always be the same. Participants gained confidence from their parents to be grateful even though floods often occur during the rainy season. Floods are never experienced throughout the year.

*All families think that the important thing is not to flood it daily so that we can accept the existing conditions. (P1)*

*Because all of the areas are indeed flooded, it seems that everyone thinks the same, that floods are also only once or twice a year. (P2)*

*The usual flood of things … the same will be the same as before. So it is okay … (P7)*

*Together with friends playing flood water to get rid of boredom. All houses have tires in preparation for a flood. So when it floods, if everyone is bored, play with tires. we felt like we were in a large free swimming pool. (P11)*

## 3.5. Vulnerability

The vulnerabilities are (1) modifiable (physical and psychological health problems, source of income, environment, and education) and (2) unmodifiable (inherent characteristics).

*I am worried about the flood; what if the flood lasts a long time and the water gets higher? I could not sleep well during the flood … It was dark because the power went out, making the atmosphere tense. After the flood, there is still a worry about what if it floods again. Tired of cleaning mud, trash and dead animals like rats, frogs, and cockroaches. An unpleasant situation when cleaning the house after the flood. (P2)*

*I am worried what if the floods last long and the water keeps rising. My family did not evacuate and survived on the 2nd floor. I could not sleep well at night. After the flood, I am still worried because my house always floods first. It is closest to the river. (P6)*

*I am sad for my parents because, during the flood, they cannot go selling around. My father does not get money. It is sad if the long flood means you cannot sell for a long time. After the flood, I am relieved because my father can sell it again. But I still worry about what if it floods again in the future. (P8)*

*… rarely get sick and never know how to maintain physical health, let alone mental health … (P13)*

## 3.6. Self-potential

The knowledge possessed by the participants includes (1) general knowledge of the causes, (2) how to prevent, and (3) what to do during a flood.

*Flood is a natural disaster during the rainy season when the water rises to the settlements. The way to prevent flooding is that we don't have one in our area because the area is prone to flooding. There is nothing you can do when there is a flood; wait for the flood to recede. (P4)*

*Floods occur because the area is low-lying and near a river, so when the river water is high during the rainy season, it can inundate the village; how to prevent flooding by elevating the house so it does not flood. When it floods, you must secure things at home so they do not get wet. (P5)*

*Floods are natural disasters caused by rainwater which causes rivers to overflow. How to prevent it*

*by not throwing garbage into the river. The garbage piled up and clogged the river. During a flood, what can be done is to stay in the flood location or evacuate. (P9)*

### 3.6.1. Participant assertiveness

This includes (1) the participants were able to express their opinions about the conditions in which they lived. Participants believed that the flood disaster they experienced was difficult to avoid because of the location of their residence near the river. (2) Defending rights: participants feel that their parents pay more attention to younger family members when a disaster occurs.

*Floods occur because rivers overflow and people live near rivers, so their houses often flood. (P3)*

*Likes to feel sad because parents think we are already independent so that only younger siblings are more care by parents. (P4)*

*Floods also occur when it rains heavily in the mountains because our area is the lowest, so it's easy to flood. (P5)*

*Often feel that parents pay more attention to younger siblings. Our younger sibling is more cared for and protected by our parents than me. (P9)*

### 3.6.2. Participant coping behavior

This includes (1) focuses on problems and (2) focuses on emotions.

*I am worried that the flood will take a long time and the water will get higher, so I pray it will recede quickly. I try to surrender to accept all existing conditions. Sleep should be with other families to reduce fear. (P2)*

*I have to be close to my parents and siblings and pray a lot so I'm not afraid. (P3)*

*I still pray because prayer can calm down when facing a disaster, reducing worry. (P6)*

*Sad because it's hard to find school work during the floods. Just make a makeshift assignment. Even if the teacher assesses it sober, it's okay. When I feel tired of helping my parents clean the house, I still do it because it's not only my house that was flooded, but almost all of them were flooded. (P11)*

### 3.6.3. Confidence in self-ability

This helps (1) face challenges as much as possible, (2) carry out obligations according to circumstances, and (3) be sure of yourself from previous experiences.

*From myself, if it is because of the floods, it does not make school work still have to be done later, or the grades will be empty. (P1*)

*Seeing parents calm down so I calm down too. I thought I should not be a burden to my parents. (P2)*

*Because I've experienced it before, even though it is flooded, I'm still safe. I try to think that the flood will be like the previous one. (P3)*

Social support includes (1) parents and (2) friends and religious leaders.

*I must be close to my parents and siblings to be safe. If I have to leave the house, always with friends. (P3)*

*Neighbors look relaxed, so I enjoy the flood conditions that have receded for a week at most. (P4)*

*Learning from Ustadz lecture, if there is a problem, you have to stay calm so you can stay safe because disaster is not our plan. (P6)*

## 3.7. Expert discussions

Expert discussions include three key informants from National Board for Disaster Management and Academics of disaster nursing experts. The results of expert panels were included in developing an adolescent coping model in seasonal flood-prone areas. The results are as follows:

1. Implementing the global target achievement of the Sendai Framework in Indonesia uses the Disaster Risk Reduction (DRR) paradigm.
2. DRR is operated in psychological recovery to provide psychosocial support and mental health services for adolescents.
3. There is a need to guide adolescents with mental health disaster training to strengthen self-potential.

## 3.8. Coping model for adolescents in seasonal flood-prone areas

Based on categories, expert panels, and the conceptual framework of the present study, the coping model

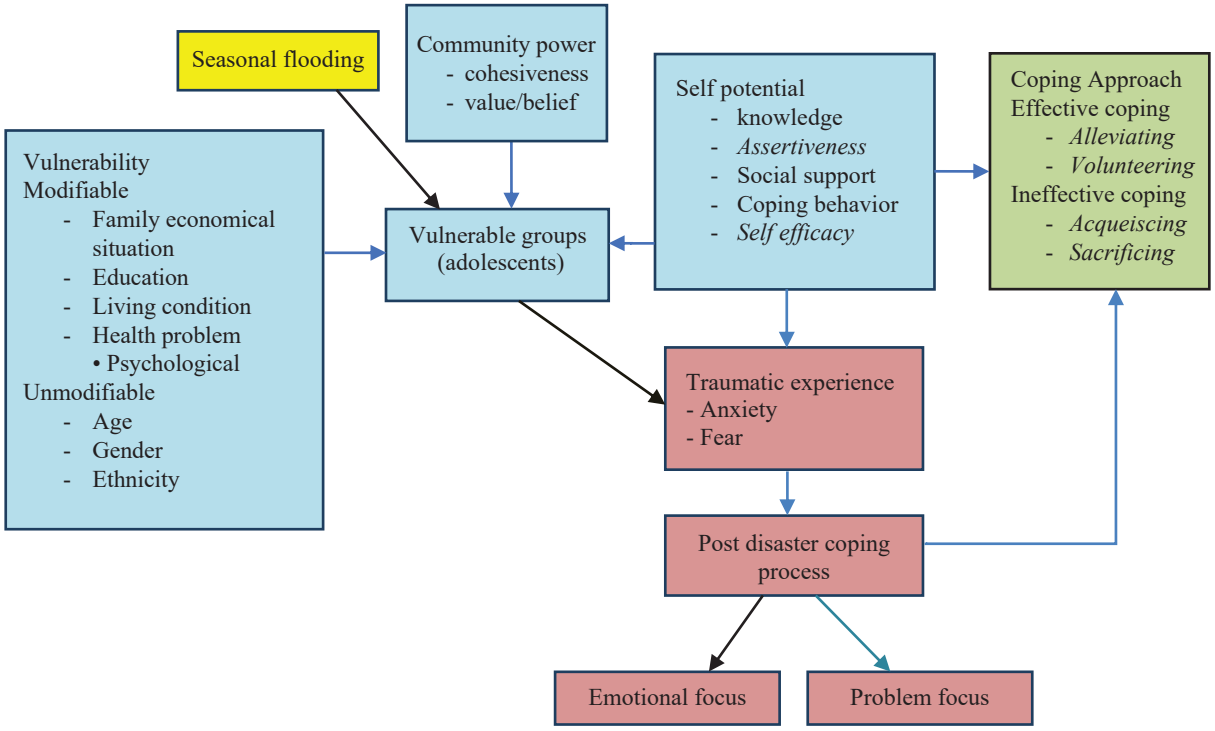


**Figure 2.** Coping model for adolescents in flooding prone areas.

was developed for adolescents in seasonal flood-prone areas (Figure 2).

## 4. Discussion

The results of this study indicated that participants experienced anxiety, sadness, and fear, which are consistent with the findings that anxiety increases after flooding in the disaster zone.[22] They are also consistent with the findings of another study that flood events are associated with an increased prevalence of anxiety disorders. Children and adolescents are particularly vulnerable. It is assumed that they have fewer coping strategies after traumatic flood disasters and experience less self-efficacy.[23] Considering this, the community mental health nurses should increase adolescents' mental health assessment in seasonal flood-prone areas.

Not all participants used effective coping strategies to deal with negative emotional responses, although some used spiritual coping. Spiritual coping has been associated with health and it plays an essential part in many dimensions of life. It focuses on how individuals may use it to deal with a stressor.[24] Some participants have yet to use effective coping strategies. It needs to be improved through education on disaster mental health support programs in seasonal flood-prone areas.

The current study aimed to evaluate the feasibility of our adolescent coping model from the viewpoint of practicability and acceptability and determine whether community mental health nurses can utilize this model to promote disaster mental health among adolescents in seasonal flood-prone areas.

The coping model for adolescents in flood-prone areas describes the main components of the community strength factor as a support system in the environment, the vulnerability factor as a protective factor and a risk factor, and interpersonal resources as a component of strength. The main supporting components are coping approaches, traumatic experiences, and disaster coping strategies.

Community strength or power is one of the main factors influencing vulnerable groups (adolescents), which aligns with the community as the most important aspect of disaster management. The community becomes the focus of studies in disaster risk reduction, which starts from groups as targets for empowerment.[25]

Self-potential or interpersonal resources are the other main factors influencing adolescents. Their capacities should be used in disaster risk-reduction programs. Enhancing adolescents' understanding and promoting disaster readiness can increase their resilience.[26] It is also consistent with another study that adolescents involved in disaster risk reduction improved their

interpersonal skills. This helps them develop particular skills in anticipating and responding to disasters.[27] Considering this, disaster risk-reduction training is needed to increase adolescents' intrapersonal resources in seasonal flooding areas.

Vulnerability can be a protective factor or risk factor for adolescents. As a risk factor, it will hurt adolescents. Screening is essential for teenagers. Being vulnerable victims, they must get access to health services and strengthen their connections. Health service providers have the opportunity to detect mental health problems.[28] So community mental health nurses must detect mental health problems and increase the protection factor. Increasing protective factors can help adolescents' readiness for disasters.

Adolescent coping models in seasonal flood-prone areas are expected to be accepted as a framework for mental nursing practices by community mental health nurses. Through this model, disaster nursing interventions conducted by nurses are expected to be focused on efforts to increase the use of effective adolescent coping in adolescents who live in areas prone to seasonal floods.

Adolescents who live in disaster-prone areas need disaster mental health preparedness to protect them from adverse psychological effects. They need mental health preparedness to realize and understand their psychological reactions during a disaster. This study gives a framework on how disaster mental health preparedness builds adolescents coping with the main components of vulnerability, community power, and self-identity.

It is suggested that the model from this study be applied to a larger population of various cultural backgrounds. Further studies to measure relationships among the concepts of the coping model would be recommended.

## 5. Conclusions

The current study aimed to develop and verify the feasibility of an adolescent coping model in seasonal flood-prone areas. This adolescent coping model is practical, and the modifications helped further improve the direction of nursing support for better practicality and acceptability. Our adolescent coping model can be used as a reference by community mental health nurses who have tasks for adolescents and may promote adolescents' self-efficacy in seasonal flood-prone areas. Future research is needed to determine the effect of intervention using this model.

## Limitations

The limitations of the participants' research in this study may not represent the diversity of adolescents in areas prone to seasonal floods. All participants in this study live in one region, which may be biased because they do not represent a large area so it can affect the findings. The data in this study give a broad description of the adolescents coping model in seasonal flood-prone areas. Quantitative assessment may be needed in the future to use this model.

## Author contributions

SN, M, NH, and DG designed and conducted this study, collected data, and reviewed and revised data for submission. All authors approved the final manuscript for submission.

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## Ethical approval

The research was approved by the ethics review board of Faculty of Nursing Universitas Indonesia (IRB approval number: Ket-179/UN2.F12.D1.2.1/PPM 2021).

## Conflicts of interest

All the authors declare no conflicts of interest.

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