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Original Research

The Influence of Fire Simulation on Community Preparedness in Facing Household Fires in Sudiroprajan

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ABSTRACT

Background: *Structure sustained structural damage, lost possessions, and incurred financial losses due to the fire. Disaster simulation is a tool that can be used to train people to prepare themselves in the face of disasters. The goal of the study is to determine how fire simulation affects community readiness in the event of a residential fire disaster.* ***Methods:*** *The study employs a quantitative approach using a quasi-experimental design with a one-group pre-test and post-test without a control group. A total of 20 respondents participated in a fire disaster simulation, and their preparedness levels were evaluated before and after the simulation using purposive sampling.* ***Results:*** *The simulation was provided, the all of respondents had a preparedness level categorized as unprepared, with 20 respondents (100%). After the preparedness simulation, the number of respondents who initially were unprepared increased, with 2 respondents (10%) now categorized as very prepared and 18 respondents (90%) as prepared. The Wilcoxon test analysis shows a p-value of 0.000, which indicates that there is an effect of fire simulation on the community's preparedness to face household fires.* ***Conclusion:*** *The fire simulation had a positive impact on enhancing community preparedness for household fires.*

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INTRODUCTION

Fire disasters are one of the most common calamities that occur in Indonesia and various other regions around the world. Global climate change is making modern cities more prone to fires. A multitude of fire incidents have occurred in a range of settings, including shopping centers, schools, hospitals, high-rise buildings, and residential areas (Putri *et al.*, 2021). In addition, the noticeable acceleration of population growth has raised demand for housing. As a result, residential areas have become denser and more congested, raising the risk of additional fires in the future (Reza *et al*., 2022). There are two types of reasons that start fires: natural and man-made. Examples of fires brought on by natural causes include coal burning, volcanic eruptions, and lightning without rain (Saharjo & Hasanah, 2023). Non-natural factor fires are typically the result of human error, including the use of cooking appliances, actions that start fires in combustible areas, shoddy or inadequate electrical installations, and the use of excessive power, which can wear down the protective layer of cables (Casban *et al*., 2020).

The United States Fire Administration (2023) reports that there were 1,388,500 fire occurrences in the United States year 2020. Meanwhile, 5,400 disaster events have been recorded in Indonesia in 2023, with land and forest fires accounting for 2,051 incidents, extreme weather accounting for 1,261 incidents, and floods accounting for 1,255 incidents, as reported by the Indonesian catastrophe Information Data (BNBP, 2023). There were 637 fire occurrences in Central Java between January and July of 2023. According to (Portal Data Jawa Tengah, 2023), 637 incidences of fire incidents nationally are represented by this figure, which represents 46.39% of all fire events. In Surakarta city, there were 139 fire incidents reported in 2022, of which 87 happened inside the town bounds and 53 outside. The primary cause was electrical short circuits, which accounted for 41 incidents and Gas explosions (LPG) followed with 16 cases. Reports from 2023 state that there were 257 fires in various region, with the Sudiroprajan subdistrict neighborhood seeing one of the largest flames that destroyed seven houses.

The impact of a fire varies greatly depending on the scale, type of fire, and the environment in which it occurs. Some common impacts that can occur due to fires include loss of life, physical damage to buildings, loss of property, economic losses, and environmental damage (Pasai, 2020). Dense population environments, irregular building patterns, and non-permanent structures which are more vulnerable to fires are characteristics of areas with a high risk of fire. Self-awareness and understanding of fire are necessary, such as the ability to recognize signs of fire danger, assess potential risks in the surrounding environment, and knowledge of fire response preparedness (Bagaskara & Santiko, 2021).

The emergency a disaster response process is hampered by the community's lack of information as human resource managers and environmental managers regarding the different fire dangers in the area. In this case, efforts are needed to address fire emergencies, such as disaster mitigation. One important element in fire mitigation is preparedness for fires. The level of community preparedness varies and is influenced by various factors, making it necessary to assess how much preparedness has been established in facing disasters (Satriyo, 2023). In addition, Astari *et al*., (2020) state that preparedness is emphasized more on efforts to prepare the ability to respond to fires accurately and quickly, with the aim of reducing the losses that occur. The steps that need to be taken to ensure disaster preparedness include conducting training and

emergency simulations. The measures that need to be taken to ensure disaster preparedness are to conduct training and emergency simulations (Kinanti & Porusia, 2023).

Training is a systematic and planned process aimed at significantly enhancing knowledge, attitudes, and skills to fulfill an individual's responsibilities in preparing for a new role. One effective form of training is disaster preparedness training through simulation methods (Virgiani et al., 2022). Disaster simulations are a way that can be used as a training tool to prepare for facing disasters. Disaster preparedness training includes several aspects related to instructions on self-rescue actions during disasters and the prevention of accidents that can be anticipated in daily routines. The implementation of this simulation can enrich individuals' skills and understanding in disaster management (Yustisia et al., 2019).

The knowledge and attitudes gained from preparedness training are supportive factors for the community in facing disaster threats. The active role of the community is essential in disaster response from the outset, before rescue teams arrive at the scene (Yuliana & Akbari, 2023). Knowledge about emergency response serves as a reference for disaster response and influences attitudes and preparedness in facing disasters. When individual preparedness knowledge is low, the negative impact can result in significant property loss and a high number of casualties due to fires (Dewi & Handayani, 2019).

Based on the interview results in December 2023, two residents affected by the fire stated that they had received training in the form of materials, but had not yet received fire simulation. The results from the knowledge questionnaire filled out by 10 people showed that 3 individuals had good knowledge with a score of 80% regarding the causes and handling of fire disasters. Three others demonstrated sufficient knowledge with a score of 67% about what needs to be done during a fire, while 4 people scored 50% on the classification of fires and methods for extinguishing flames using both modern and traditional fire extinguishing tools, indicating that these measurement results fall into the poor category. According to the research conducted by Daniyal *et al.,* (2023), it presented that disaster simulations enhance disaster preparedness in communities, raising the initial moderate level of preparedness to a high level.

The aim of this research is to analyze the impact of fire simulations on community preparedness in facing household fires in Sudiroprajan. The focus of this research is on disaster management nursing, with the hope of enhancing understanding of the effectiveness of simulation training in preparing communities to face emergency fire situations in household environments. This research also aims to provide recommendations for nurses and disaster management personnel to enhance education and preparedness in local communities. therefore, based on the explanation above, the reseacher is interested in conducting further research on "The Influence of Fire Simulation on Community Preparedness in Facing Household Fires" in Sudiroprajan.

MATERIALS AND METHOD

This research used a quasi-experimental design with one group pre-test and post-test without a control group. The population of this study consists of 41 residents of Samaan Village RT 02 RW 03 in the Sudiroprajan sub-district. In sampling, a minimal sample is used because the number of samples for a simple experimental study consists

of 20 respondents were given a fire disaster simulation, and their disaster preparedness levels were measured before and after the simulation.

The sampling technique used is purposive sampling, with inclusion criteria that include residents of RT 02 in the Samaan village of Sudiroprajan who have never received fire simulation training, aged 17 to 64 years, and are willing to be respondents. Additionally, the inclusion criteria consist of residents of RT 02 who are unable to attend due to illness or relocation, as well as residents who do not participate in all activities and withdraw.

The location of this research is in RT 02 RW 03 Samaan Village, Sudiroprajan Subdistrict. The research was conducted on May 4, 2024, for 120 minutes, with 60 minutes for material presentation and 60 minutes for simulation. A pre-test was conducted before the material was provided, and a simulation was carried out afterward, followed by a post-test, each lasting approximately 15 minutes. The delivery of the material and simulation was accompanied by two representatives from the Surakarta City Fire Department as resource persons.

The assessment instrument uses a preparedness questionnaire consisting of 20 statements according to preparedness indicators, which include policies and guidelines, mobilization, emergency response plans, and early warning systems, with a response scale ranging from strongly agree to strongly disagree. The research instrument has been tested for validity and reliability in the Pasar Kliwon sub-district with a total of 30 respondents, resulting in a validity test score (r score) of 0.366-0.637 and a reliability test using Cronbach's Alpha value of 0.878, which is greater than 0.60.

Normality testing is conducted first before bivariate analysis, using the Shapiro-Wilk test because the number of research respondents is less than 50. The results of the normality test indicate that the data is not normally distributed, and the bivariate analysis uses the Wilcoxon test This research has been approved for ethical feasibility by the Research Ethics Committee of Aisyiyah University Surakarta, with ethical approval number 211/VII/AUEC/2024 the publication date of the ethical eligibility is July 23, 2024.

RESULTS

Based on the characteristics respondents related to the level of community preparedness in facing household fires in Sudiroprajan Village. Here are the results from the data that has been obtained, showed in Table 1.

Tabel 1 Characteristics Respondents

Characteristic	Frequency	%
Age		
< 20 years old	1	5
21 – 30 years old	2	10
31 - 40 years old	3	15
41 – 50 years old	5	25
51 – 60 years old	7	35
> 60 years old	2	10
Gender		
Male	12	60
Female	8	40
Education		
Elementary school	4	20
Junior high school	2	10

Senior high school	12	60
Academy	1	5
Bachelor	1	5
Total	20	100

Source: primary data processed in 2024

The frequency distribution of the characteristics of the community in Sudiroprajan shows that the majority of the population is aged 51 to 60 years, with 7 respondents (35%). According to the frequency distribution of gender in the Sudiroprajan community, there are 12 male respondents (60%) and 8 female respondents (40%). In terms of education, the frequency distribution indicates that the majority of the Sudiroprajan community has a high school or vocational high school education, with 12 respondents (60%).

The normality test of the data is conducted before analyzing the data to determine the differences in community preparedness before and after the fire simulation treatment. In the data processing for this normality test, Shapiro-Wilk is used because the number of research subjects is less than 50, with a significance level of 95%. The results of the normality test are showed in tabel 2 normality test.

Tabel 2 Normality Test

Data	**N**	***Shapiro-Wilk P Value***	**Description**
Pre test	20	0.024	abnormal
Post test	20	0.020	abnormal

Source: Primary data processed in 2024

Based on Table 2, it is known that the frequency distribution of the normality test of the data above shows that the results of the fire simulation treatment before are 0.024 and after are 0.020. Both values have a P value < 0.05, indicating that the data is declared not normally distributed, and the data analysis technique that will be used is the Wilcoxon test analysis. Table 3 showed a bivariate analysis of how to handle household fires before and after the fire simulation.

Tabel 3 The Influence Based on the Level of Community Preparedness Before and After Fire Simulation Training

Data	**Mean rank**	**Z score**	***P-value***	***Description***
Policies and guidelines				significant
Pre test	11.50	-2.132	0.033	
Post test	11.50			
Mobilization				significant
Pre test	50.68	-7.201	0.000	
Post test	64.62			
Emergency response plan				significant
Pre test	44.63	-7.040	0.000	
Post test	50.74			
Early warning system				significant
Pre test	12.42	-2.990	0.003	
Post test	15.07			
Preparedness *Pre-test*	48,45	-3.932	0.000	significant
Preparedness *Post-test*	62,40			

Source: primary data processed in 2024

Based on the Wilcoxon test analysis table above, it is explained that the policy and guideline indicator has the same pre and post-test score of 11.50 with a z score of 2.132. The mobilization indicator has a pre-test mean rank of 50.68 and a post-test mean rank of 64.62 with a z score of 7.201. The emergency response plan indicator has a pre-test mean rank of 44.63 and a post-test mean rank of 50.74 with a z score of 7.040, while the early warning system indicator has a pre-test mean rank of 12.42 and a post-test mean rank of 15.07 with a z score of 2.990. The average score for the pre-test readiness is 48.45 (48%) and for the post-test, it is 62.40 (62%) with a p-value of 0.000 < 0.05 and a calculated Z of 3.932 > the table Z of 1.96. This indicates that there is an influence of fire simulation on community preparedness in facing household fires in Sudiroprajan.

DISCUSSION

The differences in research results that have been conducted are influenced by several factors, namely age, education, and gender. The research results show that 35% of the respondents, or 7 individuals, are aged between 51 and 60 years, followed by 25% or 5 respondents in the age group of 41 to 50 years. According to Artini *et al*., (2022), age is also related to the experiences that individuals have gone through. As one ages or gains more experience, they tend to think more maturely or their thought processes become deeper. In the age range of 41 to 60 years, individuals will pay more attention to preparing for success in adapting to aging.

Another factor that influences the level of preparedness is gender. The data presented indicates that male respondents account for 60%, which is higher than the 40% of female respondents. The difference in gender shapes distinct perceptions, which in turn influences attitudes and knowledge that vary between men and women. Men are generally more prepared than women due to their tendency to be responsive and capable of acting logically, while women prioritize emotions more. Therefore, men tend to be more responsive to early signs of disaster (Artini et al., 2022).

The level of education also affects disaster preparedness; respondents in this study had an average education level of junior high school or vocational high school (60%), totaling 12 respondents. Education is linked to the community's preparedness to face disasters. The higher the education, the greater the likelihood that individuals will acquire information and the more knowledge they will gain. Knowledge is closely related to education just as individuals with higher education tend to expand their knowledge. However, it is important to emphasize that individuals with lower education do not necessarily possess less knowledge (Budhiana *et al*., 2021).

The results of this study indicate that before the fire simulation was conducted, the average preparedness level of the respondents was 48.45 (48%), with the lowest score being 45 and the highest score being 55. It is known that the overall community in Sudiroprajan Village has a preparedness level of only 20 (100%) respondents, and after being given a fire simulation, preparedness increased significantly with 18 (90%) respondents being prepared, while 2 (10%) respondents were very well prepared, with an average score of 62.40 (62%), the highest score being 76 and the lowest 55. Before the simulation and education were provided, the respondents had never received material regarding preparedness for household fires in a traditional manner, which is why they had limited knowledge and understanding about preparedness for household fires.

Knowledge and attitudes of the community in the context of disaster preparedness play an important role. Knowledge is an essential part that everyone must possess to provide the necessary assistance or information during disaster management. Indicators or parameters that are included in preparedness consist of basic knowledge about fires, their causes, signs, and the actions that should be taken in the event of a fire, which at the very least should be possessed by the community (Trifianingsih *et al*., 2022). The emergency response plan begins with planning to meet basic needs, first aid, evacuation preparations, and disaster management training. In addition, the existence of a disaster warning system and mobilization capabilities, which include measures to respond to disasters, are important components that communities must have for preparedness in facing fire disasters (Hasna *et al*., 2023)

Another factor that influences preparedness is the policies and guidelines as steps in the implementation of disaster response. Included in effective emergency response planning is the development of a more optimal disaster warning system that is easily accessible to the community, as well as the provision of essential facilities to handle emergency situations (Jelita & Alhadi, 2019). The early warning system also plays a role in influencing the level of community preparedness regarding knowledge about fire disasters. This system is designed to detect signs of fire early in order to notify all relevant parties to take immediate evacuation or prevention actions (Satria, 2023). With this disaster warning, the hope is that the community can act quickly and appropriately to reduce the number of casualties, material losses, and environmental impacts. To achieve this, the community needs to have access to information sources regarding fire warnings from traditional and local sources. For example, a kentongan can be used as an early warning system for fire disasters, especially at night when many people are asleep. The sound of the gong can awaken the community so that they can quickly save themselves by leaving their homes (Putri, 2020). The community can use the designated evacuation routes to go directly to the meeting location upon hearing sounds or signs of a fire. By optimizing conventional and advanced disaster warning systems, the government and the community can prepare for disasters.

The implementation of the simulation in this training uses the role-playing method, where this learning invites participants to engage in an event or incident that reflects a real-life situation. This aims to provide a stimulus to encourage active participation in learning. According to the study result by Setyaningrum & Sukma (2020), simulation offers a learning experience method through constructed situations, allowing respondents to more easily understand the skills, ideas, and principles being taught. The data indicates that prior to the fire simulation, most respondents were not well prepared; but, following the fire simulation, their preparedness increased to the point of readiness. The community is better equipped to handle home fires as a result, and simulation techniques can further improve the community's preparedness for emergencies. According to research by Li *et al*., (2022), it is stated that an increase in awareness levels enhances individuals' consciousness of their skills and knowledge in responding to incidents, thereby improving their understanding of incident response.

The material provided includes general knowledge about fires, including common causes, ways to reduce and control fire risks, as well as fire management systems in household environments. After the presentation of the material, a simulation was conducted on the steps for the prevention and handling of fires in a traditional manner, using cloth or thick blankets. In disaster risk management, there are written guidelines that govern the prevention and response to fires. This guideline also explains

the position and responsibilities of the fire department infrastructure (Noviana et al., 2023). The training on the use of cloth or thick blankets aims to ensure that all participants can understand and operate the traditional fire extinguishing equipment properly and correctly. This situation allows for immediate response at the scene before the firefighters arrive (Rahmawati & Susilowati, 2020).

The results of the Wilcoxon test show that the p-value is 0.000 < 0.05, which allows us to conclude that there is an effect of fire simulation on community preparedness in facing household fires in Sudiroprajan. This study shows that simulations are an effective way to enhance disaster preparedness. It supports the findings of research by Hasymi et al. (2021), which states that there is a difference after disaster preparedness training, where participants who were previously almost ready become fully prepared. Furthermore, the study conducted by Ariyani (2020) shows the influence of landslide mitigation education on community preparedness, with a p-value of 0.001. As knowledge expands, one will receive more information and experiences in developing attitudes and will be better prepared when facing disasters, where knowledge, mindset, beliefs, and emotions play a crucial role in every decision.

CONCLUSION

Based on the research findings and the results discussed above, the following conclusions can be drawn results indicate that the community's preparedness before the fire simulation was mostly lacking, and after the fire simulation, the respondents showed a level of preparedness that was ready and very ready to face household fires. It is hoped that this will enhance knowledge and better prepare individuals to be alert and responsive in the event of household fire disasters. Additionally, the community needs to learn the first actions to take when a disaster occurs. Therefore, it can be concluded that there is an influence of fire simulation on the preparedness to face household fires in the community of Sudiroprajan.

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