

Fire Disaster Preparedness and Life Safety Program for Preparatory School Students Mentored by Community Health Nursing Students

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Abstract

Background: Fire constitute a critical type of danger in school facilities. This necessitates the execution of disaster preparedness and life safety measures, which encompass administrative and operational efforts to alleviate the occurrence of fire accidents. **Aim:** Evaluate the effect of educational program on preparatory school students' preparedness for fire disaster and life safety. **Study design:** A quasi-experimental research design was used. **Setting:** The enrolled students residence represented 12 districts out of the 17 districts in Sharkia Governorate, Egypt.

Subjects: A sample of 252 Community Health Nursing students who consequently enrolled 252 preparatory school students representing 12 districts out of the 17 districts in Sharkia Governorate, Egypt. **Tools:** Three tools were used to collect data they were; 1) Socio-demographic characteristics, 2) Assessment of the school building preparation for fire safety checklist, 3) Structured questionnaire composed of five parts they were; Students' knowledge about the fire disaster, Fire safety awareness, School evacuation practices as reported by students, and Students' attitude toward fire safety. **Results:** Statistically significant improvement post educational program was observed in total satisfactory knowledge, total adequate reported practices, total awareness, and total positive attitude regarding fire disaster. **Conclusion:** The program about fire disaster preparedness and life safety achieved improvement on preparatory school students' knowledge, awareness, reported practices and attitude. **Recommendations:** Training programs for preparatory students regarding evacuation process should be held to enhance their practices and behaviors. And fire code and safety principles must be adopted by schools adequately.

Keywords: Fire disaster, Preparedness, Life safety, Preparatory school students, and Program

Introduction

Students spend more time at school than at home. So, a safe and secure atmosphere is required for them to study and develop in a

productive way. A good education requires a safe learning environment, defense against the effects of natural disasters, and

protection from any human activity that can trigger a calamity. So, to meet all of the aforementioned circumstances, school safety is a major concern at all levels. Hereafter, the school must constantly recognize the value of a secure atmosphere (**United Nations International Children's Emergency Fund [UNICEF]. 2019**). Besides, one of the most susceptible segments of society is thought to be the student population. Building fires are among the most frequent and severe emergencies and disasters. It is crucial to protect school buildings from disasters like fires (**Seyedin et al., 2020**).

One of the most frequent risks in schools is fire. A solid school fire safety measure includes things like fire alarms, fire devices, fire drills, fire exits, and fire escapes. Disasters and tragedies resulting from school fires can be avoided with effective fire safety measures (**United Nations International Children's Emergency Fund [UNICEF]. 2019**). Students in preparatory schools are more prone to burn injuries and hence, death. Due to their lack of experience with harmful situations and their inability to respond appropriately and quickly, students under the age of 14 are particularly susceptible to the negative consequences of exposure to hazardous environments. In addition, they get panic attacks easily, making them challenge to control during emergencies or crises. Albeit, with basic safety precautions and preventive initiatives, the majority of burns can be avoided (**Rezabeigi et al., 2020**).

Unbelievably, school fires are not an unusual occurrence. In the United States, the National Fire Protection Association estimates that there are roughly 5,000 fires in educational institutions annually. Every fire carries the potential of fatalities and serious injuries in addition to high repair costs. Ensuring the education and knowledge of staff, teachers, and students on fire safety prevention and what to do in the event of a fire is crucial for everyone's safety (**Alpha Omega Disaster Restoration, 2022**). Fire safety is crucial and required in schools. The risk of injuries and building damage that flames might cause is decreased by fire protection measures. Not only is it mandated by law, but developing and executing fire safety procedures at schools is essential to everyone's safety in the event of a fire (**Deer, 2020**).

To safeguard students' healthy social and cultural development in the wake of disasters. In addition to reducing the risk of disaster and enhancing community resilience generally, safe schools are necessary to protect staff from harm and death (**Lai et al., 2016**). For the community's benefit as well as the users, educational facilities should be planned and constructed with an appropriate level of fire safety. So, to comply with the appropriate rules and standards, all fire safety measures must be provided (**Salaheldin et al., 2021**).

Adequate procedures must be implemented to incorporate the following five common fire safety principles code including: First, prevention (either preventing a fire from

starting or minimizing its consequences). Second, detection and communication: This refers to the process of looking into and finding fires, then alerting residents and the fire department. Third, encouraging occupants to avoid and flee from the impacts of fire is known as "occupant protection." Fourth, containment refers to the process of containing a fire and its aftermath to a minimum possible area. Fifth, extinguishment putting out fires and safeguarding the environment (**International Fire Safety Standards Coalition (IFSSC), 2020**).

Disaster education programs can improve one's capacity to behave appropriately, and prompt action in an emergency can prevent unfavorable results and save lives (**Abozeed et al., 2019**). A student's knowledge, abilities, and comprehension of how to react effectively to minimize fire damage are all improved by participating in a fire safety education program, which is crucial to fire prevention and preparedness (**Brown, 2019**). Community health nurses are crucial to disaster preparedness, response, and prevention; these activities call for technical skills like a foundational understanding of science and prior disaster experience. For unexpected events to be handled efficiently, nurses need to be sufficiently trained and equipped for emergencies. As response team members, triage officers, caregivers, coordinators of care and services, educators, and counselors, among other dynamic roles, nurses can effectively respond to disasters (**Aykan et., 2022**).

Significance of the study:

Children suffer unintended injuries and deaths from fires more often than any other cause. Every year, catastrophes strike schools all around the world, affecting students' safety and health with a range of destructive effects (**Children's Safety Network, 2022**). Data suggest that a considerable proportion of fire-related deaths and injuries globally have occurred in schools. The availability of several sorts of combustibles, including chemicals used in science labs, flammable paper documents, wooden furniture, and class decorations, is blamed for this. Additionally, there is little enforcement of fire safety precautions in schools (**Hassanain et al., 2022**).

According to data released by the Central Agency for Public Mobilization and Statistics (CAPMAS), there were 51.9 thousand fire accidents in Egypt in 2020 as opposed to 50.6 thousand in 2019, this represents a 2.6% rise in disasters (**CAPMAS, 2020**). Additionally, fire safety is related to the United Nations (UN) sustainable development goals 3, 4, 8, 9, 11, 12, 13, 16, and 17 (**International Fire Safety Standards Coalition (IFSSC), 2020**). As well, educating kids about health and safety at the same time they learn to read and write helps them integrate these concepts into their daily lives and ways of working and playing. They acquire a positive attitude toward health and safety that they carry with them throughout their careers (**European Agency for Safety and Health at Work (EU-OSHA), 2023**). Consequently, it is inevitable to evaluate the effect of educational program on preparatory

school students' preparedness for fire disaster and life safety.

Aim of the study:

The present study aimed to evaluate the effect of educational program on preparatory school students' preparedness for fire disaster and life safety.

Specific objectives:

1. Assess community health nursing students' and preparatory school students' preparedness regarding fire disaster to determine educational needs.
2. Plan and implement fire disaster preparedness and life safety educational program for community health nursing preparatory school students.
3. Evaluate the effect of educational program on preparatory school students' preparedness for fire disaster and life safety.

Research hypothesis:

Educational program can improve preparatory school students' preparedness regarding disaster prevention and life safety.

Operational definition

Preparedness:

- To make ready beforehand for some purpose, use, or activity (**Merriam-Webster dictionary**)
- Is the state of being ready or willing to do something (**Oxford & Cambridge dictionary**).
- The awareness, knowledge, attitudes, and practice.

I. Subjects and Methods

2.1. Research Design: - A quasi-experimental research design was used to carry out the current study.

2.2. Study Setting: - The current study was conducted in 252 governmental preparatory schools from 12 district out of the 17

districts in Sharkia Governorate namely, Zagazig, Minya El-qamh, Kafer Saqr, Awlad Saqer, Belbeis, Diarb Negm, Hehya, Faqous, Al Hosainya, Abu Hammad, Abu Kabir, and Al- Ebrahemya (These districts were the home residence of Community Health Nursing students, who later on applied the program on preparatory school students from the same dwelling).

2.3. Subjects: - The study sample comprised of 252 nursing student who conveyed the program to 252 preparatory school students from the same nursing students' neighborhood in Sharkia Governorate, according to the **following inclusion criteria**; both sexes, aged 11 to 15 years, willing to participate in the study and able to communicate.

Sampling technique:

A multi-stage random sampling technique was used in the following sequence:

First stage: Selection of Community Health Nursing students

A systematic random sampling technique was used, where a sample (252 student) was chosen from the 420 Community Health Nursing students attending 4th grad first semester 2022-2023 were selected from a list by random starting point and with a fixed periodic interval until (each third student) the sample required completed. Then conducting pretest and providing the program by the researchers. The researchers repeated the program many times for some nursing students until they become assured that they completely become qualified to mentor school students.

Second stage: Determination of sampling units (preparatory school students)

Nursing students assessed their neighborhood searching for preparatory school students who match the criteria.

Third stage: Selecting representative sample

Preparatory school students found by each nursing students were chosen by purposive sampling technique. Then, conducting pretest, program and posttest by Community Health Nursing students.

Sample size calculation:

The sample size was calculated by software Epi-info package, assuming a prevalence of fire safety knowledge about 78% (**El-Sherbini et al., 2020**) among 369970 preparatory students at Sharqia Governorate (**Ministry of Education Information Center, 2022**), level of confidence 95% and power of test were 80%. The sample size was 252 students. The sample size determined according to the equation of **Charan and Biswas (2013)**.

2.4. Tools for data collection: - For collecting data from preparatory school students, two tools were used they were;

Tool I: Socio-demographic characteristics by Fahmy et al. (2015), as it was used to scale the socioeconomic students. It included 12 questions about age, sex, mother's education, father's education, mother's work, father's work, computer use, income, family size, crowding index, and sewage and refuse disposal.

Scoring system: students' social class was considered low for score lower than 40% (<19.2 point), middle for score from 40% to less than 70% (19.2 to <33.6 point), and

high for score of 70% or more (33.6–48 point).

Tool II: Assessment of the school building preparation for fire safety checklist

This checklist was prepared by the researchers guided by **Kanyasan et al. (2018)**, **El- Sherbini et al. (2020)**, and **Fire Department City Of New York [FDNY Smart] (2022)**. It composed of six parts: It composed of 12 items about school building readiness for fire safety as presence of extinguishers, emergency exits, alarm system, posters for safety, special stairs for handicapped, water Hose reels, guidance panels, first aids box, classroom desks arrangement, corridors free of obstacles, school clinic is prepared for emergent situations, and presence of trained team for crisis and disaster management.

These questions' response answers were either yes, it is present in my school or it is not present.

Tool III: structured questionnaire prepared by the researchers guided by **Kanyasan et al. (2018)**, **El- Sherbini et al. (2020)**, and **Fire Department City Of New York [FDNY Smart] (2022)**. It composed of five parts:

Part 1: Students' knowledge about the fire disaster

This part included six open ended questions about fire causes, types, methods and rules of firefighting, steps to use a fire extinguisher and elements of security and safety measures for fire prevention.

Scoring: Responses were scored as complete correct (2), incomplete (1) and incorrect (Zero). students' responses were summed up and converted into percent,

where $\geq 60\%$ (from 7 to 12 points) considered "satisfactory knowledge", and $< 60\% (< 7 \text{ points})$ considered "unsatisfactory knowledge" about fire disaster.

Part 2: Students' fire safety awareness

This part covered 8 questions regarding school student awareness about fire safety measures as; when a fire is observed, the emergency alarm should be triggered, and the emergency response team should be called, escape routes should be left unhindered to facilitate the flow of individuals when needed etc. Responses were yes (1), and no (Zero).

Scoring: students' responses were summed up and converted into percent, where $\geq 60\%$ (from 5 to 8 points) considered "aware", and $< 60\% (< 5 \text{ points})$ considered "not aware" of fire safety measures.

Part 3: School students' fire safety reported practices

This part comprised 12 questions about schools' practices regarding fire safety as reported by school students including presence of disaster management team, fire drills, risk communication method, turning off electrical appliances at the end of the school day, periodic training, periodic maintenance of fire extinguishers, electricity maintenance by specialists, distribution of fire extinguishers in strategic places as labs, fire safety policy, diverse firefighting equipment, periodic inspection of firefighting equipment, and taking corrective action for previous incidents. The response answer options were either yes (scored 1) or no (scored zero).

Scoring: Students' responses were summed up and converted into percent, where $\geq 60\%$

(from 7 to 12 points) considered "adequate practice", and $< 60\% (< 7 \text{ points})$ considered "inadequate practice".

Part 4: School students' attitude toward fire safety

This part involved 8 questions, as I will respond to the fire alarm and remove residents from the building, whatever we do we cannot prevent or control a fire, when a fire is observed, the emergency alarm should be triggered and the emergency response team should be called, presence of a sign indicating "exit routes" enhances fire safety, it is important to have sufficient signs indicating a suitable gathering point in case of emergency, and the use of gas in housekeeping classes and waste incineration. The response answer options were either agree (scored 1) or disagree (scored Zero). For reverse questions, score was converted.

Scoring: students' responses were summed up and converted into percent, where $\geq 60\%$ (from 5 to 8 points) considered "positive attitude", and $< 60\% (< 8 \text{ points})$ considered "negative attitude".

Part 5: School Evacuation practices as reported by students

This part included two subitems, they are:

- A. This part encompassed three introductory questions about evacuation process as; Whether schools train students about evacuation (yes or no), Whether student is holding information about evacuation process (yes or no), and an open-ended question about student's source of information.
- B. In addition, 22 questions describing the process of evacuation, its response answer

options were either must (scored 1) and must not (scored Zero).

Scoring: Students' responses were summed up and converted into percent, where $\geq 60\%$ (from 13 to 22 points) considered "adequate practice", and $<60\%$ (< 13 point) considered "inadequate practice".

N.B. Nursing students' data were collected using only part 2 (knowledge), 3 (awareness) and part 5 (reported practice) of the above mentioned second tool.

2.5. Preparatory phase: - Using books, relevant research articles, and the internet, a review of previous and current research as well as theoretical understanding of many study components was conducted in order to become familiar with the research topic and design the study tools.

2.6. Tools validity: - Three staff members from Zagazig University's Faculty of Nursing, Community Health Nursing, conducted the face and content validity of the study instruments. They verified the tools' relevance, thoroughness, and clarity.

2.7. Tool reliability: - The internal consistency of the instruments was measured by computing their Cronbach alpha coefficients (0.682 for Attitude, 0. 691 for Practice, and 0.7251 for Awareness), which served as a proxy for the tools' reliability.

2.8. Pilot study: - As a way to test the questions for ambiguity and evaluate the tools' practicability and practicality, pilot research including 10% of participants was conducted. The time required to complete the data gathering tools was also estimated with its assistance. Participants from the

pilot study were included in the main study sample as there had been no modifications.

2.9. Fieldwork: -

The field work of the present study took around six months passed through consecutive stages started with official and ethical approval as follows:

Stage one: Immediately after selecting random sample representing nursing students attending Community Health Nursing course, first semester 2022-2023, Faculty of Nursing, Zagazig University, data collection process started. Extensive explanation of the aim and nature of study was done. It was important at that stage to determine Community Health Nursing students' knowledge, awareness and reported practice about fire disaster and evacuation plan, as they will be the educators to preparatory school students in their neighborhood. It took about 15 minutes for each student to fill out the tool. The students were divided into small groups (about 10 in each group). The teaching methods used were open discussion, and lecture and teaching materials were Brochures and videos.

Stage two: The content of the program was given to nursing students, also the instruction about collecting data and conducting the program in their neighborhood ranging from acceptance of preparatory school students' parents, to the pre and posttest. The program was applied individually either in nursing student home or preparatory school student home (the implementation of program in schools was so difficult because researchers had to take 252 permissions [one for each school], and

the procedure was really complicated). The teaching methods used were open discussion, and lecture and teaching materials were Brochures and videos. Posttest was done two months after the program.

Stage three: The nursing students started spreading copies of data collection tools to their neighborhoods (timetable varied according to circumstances of each student). Each student filled out the tools in about 35 to 40 minutes. The field work of the existing study took place from the mid of October 2022 to the mid of January 2023. **The program was carried out in seven sessions (from three to four weeks);**

Session 1: Collect pretest data.

Session 2: Introductory session, to give overview about the program.

Objective: To explain the purpose of the program.

Session 3: This session focused on providing knowledge about causes, types, methods and rules of firefighting, steps to use a fire extinguisher and elements of security and safety measures for fire preparedness (beside videos, a care fire extinguisher were used as a real example).

Objective: To equip students with knowledge about fire preparedness.

Session 4: The focus of this session was to equip students with knowledge about evaluation of the school building and its readiness for safety from fire.

Objective: Help students to assess school building and its readiness for safety from fire.

Session 5: This session was designed to spotlight on evacuation plan.

Objective: To identify the process of evacuation plans.

Session 6: This session was designed revise the fire safety measures using videos.

Objective: To help students attain positive attitude toward fire safety.

Session 7: Post test to evaluate the effect of program.

2.10. Ethical and administrative considerations: - Once an official permission was obtained, an ethical approval was granted from Research Ethics Committee, Faculty of Nursing, Zagazig University. Permission was deemed to have been given when the data gathering tools were filled out. Students were informed that their answers and personal information would be kept private and utilized exclusively for research. Additionally, they were informed that they might decline or withdraw at any moment.

2.11. Statistical Design: -

Data entry and statistical analysis were done using SPSS 24. For qualitative variables, descriptive statistics were employed, namely in the form of percentages and frequencies. Using the chi-square test, qualitative categorical variables were compared, and the Spearman rank correlation was employed to evaluate the link between ranked and quantitative factors. Ultimately, P-value <0.05 was used to determine statistical significance.

Results

To conduct the current study, 252 students from those attending Community Health Nursing courses were randomly nominated to be mediators to convey the program to the largest group of preparatory school students

(their neighborhoods). Their mean age was 21.50 ± 0.60 ranged from 20 -23 years, 75.4% of them were females and 71.4% were from rural area.

Pertaining to fire disaster preparedness and life safety, **table 1** presents that 54.4% of Community Health Nursing students had satisfactory total knowledge, 92.1% were aware about fire disaster and life safety, and 63.1% had adequate total reported practices regarding fire disaster preparedness and evacuation process.

Table 2 displays negative non-statistically significant correlation between nursing students' knowledge and awareness. Meanwhile, there was a statistically significant positive correlation between community Health Nursing Students' awareness and reported practices.

Considering preparatory school students' sociodemographic characteristics; **table 3** clarifies that their age ranged from 11 to 15 years, with a mean of 13.31 ± 1.06 year, 52.8% were males, 76.6% resided in rural areas, and 65.1% of them belonged to medium social class.

Table 4 indicates highly statistically significant improvement post program than pre-program as observed in total satisfactory knowledge, total adequate reported practices ($p= <0.001$) regarding fire disaster preparedness. And statistically significant improvement post program as in total awareness and total positive attitude regarding fire disaster preparedness ($P= 0.016$ & $P= 0.006$).

Regarding school buildings preparation for fire safety as reported by students, **Figure 1**

reveals that the studied schools did not have special stairs, hose reels in every floor, alarm system, emergency exists, posters about fire safety, team for crisis and disaster management or fire extinguishers as reported by 70.6%, 39.3%, 38.9%, 32.9%, 33.3%, 28.2% and 23.8% of students respectively.

Regarding preparatory school students' reported practices and sources of information, **Table 5** clarifies that 68.7% of schools did not train the students on evacuation plan. Although that, 38.9% of the students had information about evacuation plan pre-program which changed to 61.5% post-program. Additionally, students derived their information mainly (69.4%) from school-teachers pre-program, but post program their source of information was mainly the health education program (52.9%) and their teachers (43.2%).

Table 6 refers to highly statistically significant relation between pre-post students' reported practices regarding school evacuation practices, especially the items related to contacting the competent authorities for assistance, directing groups in an organized way from within the classroom, inspecting all classrooms and offices in each building, warning students not to run and overtake their classmates, and emptying assembly points in the courtyard so as not to cause an increase in the injury of students ($P= <0.001$).

Table 7 points to highly statistically significant positive correlation between preparatory school students' knowledge and awareness regarding fire disaster preparedness, as well as between their

reported practices and attitude. On the other hand, there were negative correlation between their knowledge and reported practices, the result was not statistically significant.

Table 1: Total knowledge, awareness, and reported practices of Community Health Nursing students regarding fire disaster preparedness and life safety (n=252)

Items	Pre		Post	
	No.	%	No.	%
Total knowledge:				
Satisfactory	137	54.4	252	100
Unsatisfactory	115	45.6	0	0.0
Total awareness:				
Aware	232	92.1	252	100
Not aware	20	7.9	0	0.0
Total practices:				
Adequate	159	63.1	252	100
Inadequate	93	36.9	0	0.0

Table 2: Correlation matrix of knowledge, awareness, and reported practices score of Community Health Nursing students (n=252)

Scores	Total mean score	
	Knowledge	Awareness
Knowledge		
Awareness	-.048	
Practices	.063	.145*

R: Pearson's correlation coefficient (*) Statistically significant at p<0.05

Table 3: Socio-demographic characteristics of preparatory school students (n=252)

Characteristics	No.	%
Student's Age:		
11- <13	143	56.7
13-15	109	43.3
Mean ± SD	13.31 ± 1.06	
Rang	11-15	
Gender:		
▪ Male	133	52.8
▪ Female	119	47.2
Residence:		
▪ Rural	193	76.6
▪ Urban	59	23.4
Social class:		
▪ Low	27	10.7
▪ Medium	164	65.1
▪ High	61	24.2

Table 4: Total knowledge, awareness, reported practices and attitude of school students regarding fire disaster preparedness pre –post program (n=252)

Items	Pre (n=252)		Post (n=252)		McNemar test	(P-value)
	No	%	No	%		
Total knowledge						
Satisfactory	43	17.1	238	94.4	189.13	
Unsatisfactory	209	82.9	14	5.6		
Total awareness						
Aware	149	59.1	173	68.7	5.75	
Not aware	103	40.9	79	31.3		
Total reported practices:						
Adequate	198	78.6	230	91.3	17.79	
Inadequate	54	21.4	22	8.7		
Total attitude:						
Positive	170	67.5	196	77.8	7.44	
Negative	82	32.5	56	22.2		

*: Significant

**: Highly significant

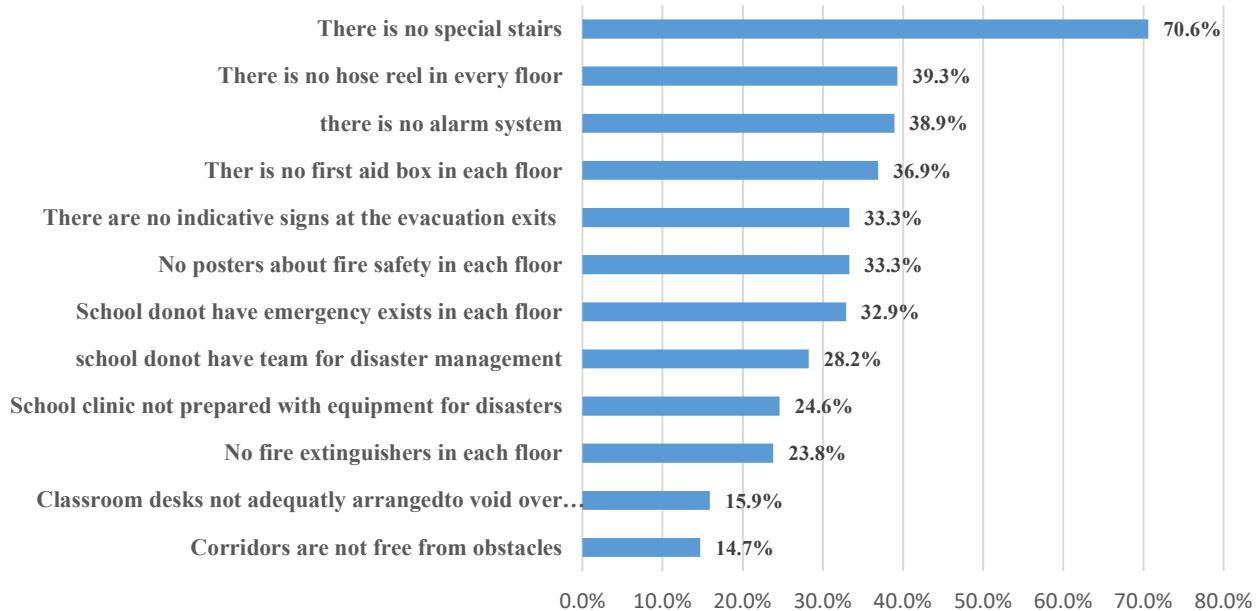


Figure 1: Assessment of schools' buildings preparation for fire safety as reported by the school students (n=252)

Table 5: Reported practices and sources of information of school students regarding evacuation process pre and post program (n=252)

Items	(n=252)		(n=252)	
	No	%	No	%
School don't train for evacuation				
Yes	79	31.3	-----	-----
No	173	68.7	-----	-----
I have information about evacuation process				
▪ Yes	98	38.9	155	61.5
▪ No	154	61.1	97	38.5
Sources of information				
▪ Internet	15	15.3	4	2.6
▪ School teacher	68	69.4	67	43.2
▪ Books	3	3.1	-	-
▪ My experience	6	6.1	-	-
▪ My family	6	6.1	2	1.3
▪ Health education	-	-	82	52.9

Table 6: School evacuation practices as reported by students pre –post program (n=252)

When evacuating	Pre (n=252)		Post (n=252)		(P-value)
	No	%	No	%	
Use an alarm intermittently and not use the school bell.	Must 49	80.6 19.4	225 27	89.3 10.7	.005*
Stop work immediately after hearing the warning.	Must 10	96.0 4.0	245 7	97.2 2.8	.607
Spread the disaster team, if any, throughout the school to deal with problems.	Must 13	94.8 5.2	250 2	99.2 0.8	.007*
Contact the competent authorities for assistance.	Must 13	94.8 5.2	251 1	99.6 0.4	.000**
That every responsible teacher has one of the floors of the school.	Must 19	92.5 7.5	239 13	94.8 5.2	.307
Switching the power off.	Must 17	93.3 6.7	246 6	97.6 2.4	.027*
Shutting off the gas supply.	Must 13	94.8 5.2	244 8	96.8 3.2	.359
Directing groups in an organized way from within the classrooms.	Must 21	91.7 8.3	248 4	98.4 1.6	.000**
Students move with the class teacher to guide them and reduce injuries.	Must 5	98.0 2.0	250 2	99.2 0.8	.453
Inspect all classrooms and offices in each building.	Must 18	92.9 7.1	252 0	100.0 0.0	.000**
Call all names to make sure they all exist.	Must 18	92.9 7.1	243 9	96.4 3.6	.049*
Students go out in groups according to floors.	Must 13	94.8 5.2	241 11	95.6 4.4	.832
The presence of a teacher with each group of students to regulate their movement and reduce the exposure to injuries.	Must 7	97.2 2.8	249 3	98.8 1.2	.344
Each group moves in two opposite directions to avoid overcrowding of	Must 14	94.4 5.6	239 13	94.8 5.2	1.00

students during the descent.						
Students in advanced grades help in the evacuation process.	Must Must not	226 26	89.7 10.3	237 15	94.0 6.0	.072
Teachers are calm to prevent students from getting nervous and panicking.	Must Must not	245 7	97.2 2.8	244 8	96.8 3.2	1.00
Employees and administrators should be calm and not confused.	Must Must not	234 18	92.9 7.1	250 2	99.2 0.8	.001*
Students should be calm and not confused.	Must Must not	217 35	86.1 13.9	248 4	98.4 1.6	.001*
Warning students not to run and overtake their classmates.	Must Must not	233 19	92.5 7.5	245 7	97.2 2.8	.000**
Student groups are directed to assembly points under the supervision of teachers.	Must Must not	240 12	95.2 4.8	250 2	99.2 0.8	.006*
Empty assembly points in the courtyard so as not to cause an increase in the injury of students.	Must Must not	240 12	95.2 4.8	249 3	98.8 1.2	.000**
It is forbidden for anyone to go to the building again.	Must Must not	240 12	95.2 4.8	248 4	98.4 1.6	.021*

McNemarTest

*: Significant

**: Highly significant

Table 7: Correlations between total knowledge, awareness, reported practice and attitude of school students post program regarding fire disaster preparedness (n=252)

Variables	Knowledge	Awareness	Practices
Knowledge			
Awareness	.247**		
Practices	-.075	.033	
Attitude	-.005	.441**	.240**

R: Pearson's correlation coefficient (*) Statistically significant at p<0.05 (**) statistically significant at p<0.01

Discussion

One of the fundamental goals of educational places is that strategic and functional design must provide secure learning environments, because of the significant fire risk in it. In light of this, these facilities ought to be planned and constructed to offer a sufficient degree of fire protection for both the community and its users. To maintain all fire readiness measures, it is necessary to provide all fire safety systems in accordance with the applicable rules and standards. Consequently, it is necessary to periodically conduct a thorough evaluation of the degree of compliance with the fire prevention measures in accordance with code requirements (**Salaheldin et al., 2021**).

Students must graduate from compulsory education with a foundational understanding of health and safety issues and their significance to successfully integrate risk prevention into the educational context. Through research initiatives, activities, studies, and experience analyses, departments at schools and universities need to increase knowledge about hazards and how to prevent them (**Burgos-García, 2015**). In this stream, 54.4% of community health nursing students had satisfactory total knowledge pertaining to fire disaster, 92.1% were aware about fire disaster and life safety, and 63.1% had adequate total reported practices regarding fire safety and evacuation process. This result might be attributed to the continuity of posting education and training activities to faculty of

nursing students as a part of disaster management unit activities inside faculty.

As for fire disaster preparedness, more than half of Community Health Nursing Students had satisfactory total knowledge, most of them were aware, and around two third had adequate total reported practices (pre-program). Albeit, post program their knowledge, awareness, and reported practices were markedly improved. Additionally, a statistically significant positive correlation between Community Health Nursing students' awareness and reported practices regarding fire disaster preparedness.

This result (pre-program) might be attributed to the activities of disaster management unit in the faculty as posters, brochures, and seminars which are held periodically, besides uploading these materials on the different platforms and social media groups of the faculty. Meanwhile, the post program enhancements is entirely attributed to the effect of the fire preparedness and life safety program.

In this stream, Saudi study (**Mohamed et al., 2023**), found that more than two thirds of nursing students had adequate knowledge and however, most of them had inadequate practice regarding disaster preparedness. Besides, a statistically significant relations was found between nursing students' knowledge and students' practice.

It is noteworthy that, the marvel improvement in post test results of Community Health Nursing Students was not by chance. Instead, it was intentional and can be attributed the

deliberate effort paid by the researchers to guarantee that the students are actually qualified to convey the fire preparedness program for preparatory school students with the highest possible degree of professionalism.

Considering preparatory school students' socio-demographic characteristics; their age ranged from 11 to 15 years, with a mean of 13.31 ± 1.06 year, more than half were males, more than three quarters resided in rural areas, and around two third of them belonged to medium social class. In this context, a study conducted in Thailand (**Musigapong & Phanprasit, 2013**), revealed that 42.22% of elementary students were males. The mean age of them was 11.41 (SD=5.8). Regarding preparatory school students' reported practices and source of information about evacuation process, more than one third of the students had information about evacuation plan pre-program which changed to slightly less than two thirds post-program. Additionally, students derived their information mainly from school teachers as reported by more than two thirds and more than one tenth from internet pre-program, but post program their source of information was changed to more than half from health education program and more than two fifths from their teachers. This result might be attributed to keenness of some teachers in equipping their students with knowledge about fire safety. This also reflects absence of schools' interest in this vital issue.

A dissimilar result reported in Thailand by **Musigapong and Phanprasit (2013)**, who claimed that students acquainted information from multimedia such as television, teacher, newspaper, and internet. Also, Saudi study (**Mohamed et al., 2023**) declared that social media apps was the most frequent source of information (78.8%), followed by the internet (69.7%), family and friends (52.3%), books and school resources (43.7%), and television (32.4%).

As to preparatory school students' knowledge and attitude towards fire disaster preparedness (preprogram), majority of students had unsatisfactory knowledge, and two thirds held positive attitude. This again reflects absence of schools' interest in this vital issue. Or because it is not possible to conduct practical training due to the conditions of overcrowded classes, the crowded study schedule, the division of the school day into two periods, morning and evening, in addition to the fact that the evacuation plan needs to be prepared in advance in a deliberate manner. Divergent results were reported by **Alkalash et al. (2023)** who found that 53.9% of the secondary school students had a good level of knowledge, and 95.9% of them showed a positive attitude toward disaster preparedness.

Considering students' training on evacuation process (evacuation drills), slightly less than one third of students confessed that their schools did not train them. In the same vein, study conduct in Kenya (**Japheth, 2019**) disclosed that 79.6% of secondary

students confessed that their schools did not carry out fire safety. Likewise, Saudi study by **Alkalash et al. (2023)** clarified that only 34.2% were already involved in a disaster drills or workshops in the school or city. Correspondingly, **Musigapong and Phanprasit (2013)**, indicated that in their study only 18.8% of students who had practiced fire evacuation.

Regarding school buildings preparation for fire safety as reported by students, the studied schools did not have special stairs, hose reels in every floor, alarm system, emergency exists, posters about fire safety, team for crisis and disaster management or fire extinguishers as reported by 70.6%, 39.3%, 38.9%, 32.9%, 33.3%, 28.2% and 23.8% of students respectively. In this context, **Seyedin et al. (2020)** review article clarified that the percentage of deaths and the repercussions of fire are higher because of using safe firefighting equipment in the buildings was less, such as detectors and warning devices. On the contrary, a Philippines study (**Tan, 2020**) revealed that the national high schools in Kidapawan City have safety facilities as alarming system, fire extinguisher, building exits, emergency communication system, evacuation site as well as floor plan showing the evacuation area.

Highly statistically significant improvement in post program results was observed in total satisfactory knowledge, total adequate reported practices, total awareness, and total positive attitude regarding fire disaster preparedness. In the same vein,

Australian study (**Seçer & Satyen, 2006**) indicated a statistically significant main effect of fire safety training on the level of fire safety knowledge. Likewise, Indian study (**Devulkar, 2014**) concluded that there was significant increase in knowledge after the administration of Planned Teaching Program for high schools' students. Moreover, **Kennedy and Mason (2015)** in England conveyed that the fire safety program was successful in its objective to enhance knowledge and awareness of fire safety as evidenced in the post-program evaluation.

Pertaining to school students' pre-post reported practices regarding evacuation process, highly statistically significant relation was observed especially the items related to contacting the competent authorities for assistance, directing groups in an organized way from within the classroom, inspecting all classrooms and offices in each building, warning students not to run and overtake their classmates, and emptying assembly points in the courtyard so as not to cause an increase in the injury of students. This result might reflect students' high estimation of the importance of life safety related items, which must begin with following directions given by responsible authorities.

Highly statistically significant positive correlation between preparatory school students' knowledge and awareness regarding fire disaster preparedness, as well as between their reported practices and attitude. Instead, there were negative correlation between

their knowledge and reported practices. In the same vein, **Musigapong and Phanprasit (2013)**, indicated that level of knowledge related with attitudes, nonetheless the level of knowledge, and attitude was not associated with practices.

Conclusion

In the light of the present study findings and answering the hypothesis it can be concluded that the program about fire disaster prevention and life safety achieved improvement on preparatory school students' knowledge, awareness, reported practices and attitude.

Recommendations:

Based on the current study results, the following recommendations are proposed; Multimedia must attend for providing the knowledge about fire preparedness such as social media, television, beside teachers. Training programs for preparatory school students regarding evacuation process should be held to enhance their practices and behaviors. Approved educational guidelines about fire preparedness and life safety should be available in all preparatory schools. Fire code and safety principles must be adopted by schools adequately. Further research required to be carried out in a large sample to identify preparatory students' needs regarding life safety and fire preparedness.

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