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Building Capacity for Emergency and Disaster Preparedness: Basic and Psychological First Aid Training for Sanitation Workers

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Abstract
Background: Sanitation workers at railway stations often serve as first responders to traffic accidents and emergency situations **Aim:** The aim of this study was to evaluate the effectiveness of emergency and disaster preparedness among sanitation workers at Egyptian Railways through basic and psychological first aid training. **Methods: Design:** A quasi-experimental, one-group pretest-posttest design was employed. **Setting:** The training took place in the skills lab of nursing colleges. **Sample:** Sixty-six sanitation workers employed by Egyptian railways took part in the study. **Data Collection Tools: Pre- and post-training assessments** were conducted using structured questionnaires to evaluate knowledge and observational checklists to assess practical skills. **Demographic data** were also gathered. The training program consisted of three core modules: disaster preparedness, first aid for emergency situations, and psychological first aid. **Results:** Three-quarters of participants were male (75%) with a mean age of 45.41±4.31 years. Significant improvements were observed in both knowledge and practice across all training modules. Disaster preparedness: Knowledge scores increased from 10.52 to 49.21; practice scores rose from 3.18 to 10.00. First aid: Knowledge improved from 19.15 to 95.94; practice scores reached 100.00. Psychological first aid: Knowledge rose from 5.65 to 39.21; practice scores improved from 4.92 to 28.88. All improvements were statistically significant (p = 0.000). **Conclusion:** The study demonstrates that targeted training programs can significantly enhance sanitation workers' knowledge and practice in handling emergency situations. **Recommendations:** Expanding such training initiatives could strengthen emergency response capabilities and enhance public safety, particularly in high-risk public environments such as railway stations.

Keywords: Basic first aid, Building capacity, Disaster preparedness, Emergency preparedness, Psychological first aid & Sanitation workers at Egyptian railways

Introduction
Natural and man-made disasters have increased in frequency and intensity in recent years, posing significant challenges to communities worldwide (**Panday et al., 2021; & WHO., 2025).** Climate change has exacerbated these challenges, with extreme weather events such as floods, heat waves, and storms disrupting critical infrastructure, including railways (**Hyde-Smith et al., 2022; & Rocha et al., 2022)**. In such scenarios, sanitation workers play a crucial role in maintaining hygiene, preventing disease outbreaks, and supporting the restoration of normal operations. However, these workers often operate in hazardous conditions, exposing them to significant health and safety risks. Despite their vital contributions, sanitation workers frequently lack the necessary training to respond effectively to emergencies, highlighting a critical gap in disaster preparedness **(Salve & Jungari., 2020).**

Sanitation workers are integral to public health, particularly during and after disasters. Their responsibilities include waste management, maintaining hygiene, and ensuring the safety of public spaces, which are essential for preventing disease and facilitating community recovery **(United Nations., 2020).** The Sustainable Development Goals (SDGs) emphasize the importance of safely managed sanitation services, including safe waste disposal and treatment, as a key target for achieving universal access by 2030 (**United Nations., 2020).** However, the hazardous nature of their work, combined with the increasing complexity of disaster scenarios, places sanitation workers at heightened risk of physical and psychological harm (**Global Railway Review., 2017).** This underscores the urgent need to enhance their emergency preparedness through targeted training programs.

Despite their critical role, sanitation workers often lack the skills and resources necessary to respond effectively to emergencies. Many workers are inadequately trained in essential areas such as Basic First Aid (BFA) and Psychological First Aid (PFA), which are crucial for addressing physical injuries and emotional distress during disasters **(Michaels & Barab., 2020).** This lack of training not only compromises their ability to perform their duties but

also endangers their own health and safety, as well as that of the communities they serve (**Health, Safety and Dignity of Sanitation Workers an Initial Assessment., 2019).**

Furthermore, railway stations, which are high-density transit hubs, present unique challenges due to their vulnerability to medical emergencies, accidents, and psychological crises (**HASNAT et al., 2018; Health, Safety and Dignity of Sanitation Workers an Initial Assessment., 2019; Health and Safety of Sanitation Workers - Humanitarian Sanitation Hub., 2024; & Rosen et al., 2023).** Sanitation workers in these environments are often the first responders to such incidents, yet they are rarely equipped with the necessary skills to manage them effectively.

To address these challenges, there is a pressing need for specialized training programs that equip sanitation workers with the skills required to respond to emergencies. Basic First Aid (BFA) training provides workers with life-saving skills to manage physical injuries, while Psychological First Aid (PFA) enables them to support individuals experiencing emotional distress during traumatic events. Together, these competencies enhance the overall safety, resilience, and operational capacity of sanitation workers, enabling them to perform their duties more effectively in high-risk environments. By improving their technical and psychological preparedness, such training programs can significantly enhance the ability of sanitation workers to respond to emergencies, thereby improving community safety and resilience **(Kim & Han., 2021).**

Railway stations, characterized by high-density transit populations, are particularly prone to emergencies, including medical incidents, accidents, and psychological distress. Sanitation workers in these environments play a vital role in maintaining hygiene and safety, yet they often lack the skills necessary to address emergencies effectively (**Kim & Han., 2021).** This study focuses on developing and implementing a Basic First Aid (BFA) and Psychological First Aid (PFA) training program specifically tailored for sanitation workers at railway stations. By building their capacity to respond to emergencies, this program aims to enhance their operational effectiveness and contributes to the overall safety and resilience of railway environments.

Significance of the study:

According to the Central Agency for Public Mobilization and Statistics (CAPMAS), train accidents in Egypt saw a significant decline in 2023, with reported incidents dropping from 831 in 2022 to 181—a reduction of over 78%. Despite this notable improvement, the number of injuries surged from 51 to 636, indicating that although accidents became less frequent, their severity increased. While fatalities showed a slight decrease to 53, the Central region remained the most affected, with the East Delta recording the fewest incidents. Although ongoing infrastructure upgrades and improvements in signaling systems are underway, the persistently high fatality-to-injury ratio highlights enduring safety challenges within the railway system **(Arab Republic of Egypt-Annual Bulletin Results of Vehicles & Trains Accidents Year., 2022, June 2023 ed).**

In addition to these concerns, accidents at train stations continue to reflect serious gaps in operational safety. One of the most devastating examples occurred in 2019 at Ramses Station in Cairo, where an unattended train collided with a barrier, causing a massive explosion that resulted in 25 deaths and 40 injuries. The incident led to public outrage and the resignation of the Minister of Transport, underscoring the critical need for enhanced safety protocols and oversight in railway operations (**El- Said., 2019)**.

These statistics and incidents not only reveal the risks faced by railway users but also highlight the overlooked role of sanitation workers in emergency response. Often being the first to witness or arrive at accident scenes, sanitation workers are underutilized in formal disaster response frameworks. Providing them with Basic First Aid (BFA) and Psychological First Aid (PFA) training is essential to strengthening their ability to manage emergencies effectively.

This study seeks to address a critical gap in disaster preparedness by focusing on the training and empowerment of sanitation workers, who serve as informal first responders yet often lack the necessary knowledge and skills to intervene during crises. Nurses, with their clinical expertise, educational competencies, and advocacy roles, are ideally positioned to lead such training efforts. By enhancing the practical and psychological readiness of sanitation workers, this research contributes to improving railway emergency response and broadens the understanding of inclusive disaster preparedness strategies **(Salve & Jungari., 2020; & Hassmiller., 2021).**

Aim of the Study:

The aim of this study was to evaluate the effectiveness of emergency and disaster preparedness among sanitation workers at Egyptian Railways through basic and psychological first aid training.

Specific Objectives:

1. Assess the pre-training knowledge and practices of sanitation workers at Egyptian Railways in basic and psychological first aid for handling emergency situations and disasters.

2. Design and implement a training program in disaster-related basic and psychological first aid to enhance sanitation workers' capabilities in responding to emergencies and disasters at Egyptian Railways.
3. Evaluate the post-training knowledge and practices of sanitation workers at Egyptian Railways regarding basic and psychological first aid for handling emergencies and disasters.

Research Hypotheses

H1: The post-training means scores for knowledge and practice of basic and psychological first aid in handling emergencies and disasters will be significantly higher than the pre-training means scores among sanitation workers at Egyptian railways.

Methods

Research Design:

A quasi-experimental, one-group pretest-posttest design was used to achieve the aim of the current study. This design allows for the comparison of participants' knowledge and practice before and after the training intervention.

Setting:

The training was conducted in nursing skill labs at nursing colleges where the researchers are affiliated. These labs provided an ideal environment for the researchers, being well-equipped with the necessary materials for the training sessions assured that the participants gained the required hands-on experience in handling disaster and emergencies situations. In addition, the integration of real-world scenarios and practical exercises reinforced the learning experience, preparing participants to offer first aid and psychological support during distressing situations.

Sample:

A convenience sampling approach was utilized to recruit sanitation workers from three major railway stations in Egypt: Cairo, Giza, and Zagazig. Initial contact was established through individual interviews conducted on-site at each station. A total of 66 sanitation workers who expressed willingness to participate based on their availability to attend structured training sessions held in the nursing skills laboratory at the College of Nursing, and who provided informed consent were enrolled in the study. To ensure proportional representation, participants were distributed as follows: 30 from Cairo, 20 from Giza, and 16 from Zagazig.

According to the standard hiring criteria for sanitation personnel within the Egyptian railway sector, eligible participants were male or female, aged between 21 and 45 years, and literate. Participants held roles relevant to the study, such as platform cleaning, restroom maintenance, and waste management, reflecting the broad scope of sanitation duties across the selected stations.

The sample size was determined using a power analysis with an expected moderate effect size (Cohen's d = 0.5), a power level of 0.80, and an alpha of 0.05. This calculation suggested a minimum of 64 participants to detect statistically significant differences; thus, the final sample of 66 was deemed sufficient for reliable statistical analysis.

Tools for Data Collection:

Data collection was conducted using a tool developed by researchers based on relevant literature review (**International First Aid, Resuscitation, and Education Guidelines., 2020; Everly & Lating., 2022; & CDC., 2024).**

The tool consisted of two parts as follows:

Part I: Sanitation workers' assessment questionnaire to collect demographic information including their age, literacy level, marital status, income level, work experience, and previous training in disaster first aid management, basic first aid, and psychological first aid.

Part II: This part was a pre-post assessment questionnaire of knowledge, and observational checklist for practice which was divided into three sections.

Section I: To assess pre and post day one training knowledge and practice in handling disaster situations.

A- Knowledge related to climate change and disaster situations handling. This part included a pre- and post-test (50 multiple-choice questions) based on real-world scenarios, aimed at assessing sanitation workers' knowledge of disaster first aid. Total score out of 50, cut off score 80% equal 40 marks

B- Observational checklist for practice of fire extinguisher. Maximum total practice scores out of 10, cut off score 80% equal eight marks

Section II: To assess pre and post day 2, 3, and 4 training knowledge and practice of basic first aid in handling emergency situations.

A- Knowledge related to handling emergency situations first aid including: CPR, first aid for bleeding, fractures, shock, burns, stroke, and others. It included 100 multiple-choice and true/false questions based on real-world scenarios. Total score out of 100, cut off score 80% equal 80 marks

B- Observational checklist (50 steps) for assessing practical skills, including bandaging, wound care, first aid of stroke;(balance, eyes, face, arms, speech, time (BEFAST), Sim's splint, and strain first aid; rest, ice, compression, elevation (RICE). Maximum total practice scores out of 100, cut off score 80% equal 80 marks

Section III: To assess pre and post day 5 training **knowledge and practice of Psychological First Aid**

A- Knowledge of psychological first aid through a pre- and post-test consisting of 40 multiple-choice and true/false questions based on real-world scenarios. Total score out of 40. cut off score 80% equal 32 marks

B- An observational checklist (15 steps) was used to assess the practical application of stress management techniques. Maximum total practice scores out of 30, cut off score 80% equal 24 marks

Scoring System:

The scoring system was derived from **Birkhead & Vermeulen (2018) as follows:**

For knowledge in the three sections of part two, each correct answer was awarded one mark, and incorrect or "don't know" responses were given zero marks. **For practice:** For each skill step, the score was zero for not practiced, one mark for practiced incompetently, and two for practiced competently.

Validity and Reliability

Content validity was assessed by a panel of experts, who reviewed the relevance of the items based on the study's objectives. Reliability was tested using Cronbach's alpha for internal consistency; Cronbach's alpha was 0.94 for knowledge and 0.99 for practice.

Procedures

Data collection was conducted by researchers over a one-year period from October 2023 to September 2024. The training sessions were held from 3:00 to 7:00 pm for five consecutive days per group, with each group comprising 6-11 sanitation workers at Egyptian Railways. The training was organized into specific modules, with each group consisting of 11-12 sanitation workers from Egyptian Railways.

The training sessions followed a structured timetable:

Day 1: Disaster preparedness modules, which covered essential knowledge and practices related to disaster handling.

Days 2, 3, and 4: First aid modules, focusing on practical and theoretical aspects of basic first aid, including CPR, bleeding, wound care, fracture management, and treatment for shock, burns, and other relevant emergency situations, distributed over three days to enhance effective training coverage.

Day 5: Psychological first aid module, which included training on stress management techniques, providing psychological support in distressing situations, and understanding the mental health aspects of disaster response.

Each session was designed to include both theoretical instruction and hands-on practice. The researchers ensured that real-world scenarios and practical exercises were incorporated to maximize the participants' engagement and learning. Participants were assessed at the beginning and end of the training day through pre- and post-tests, which evaluated their knowledge and practical skills in disaster preparedness, first aid, and psychological first aid, **(see Table 1).**

Ethical Considerations

The study was approved by the College of Nursing at Zagazig University Ethical Committee, ID/ZU. Nur. REC #: 0033/2023. Participants were informed about the study's objectives and given written informed consent. All participants were assured that the data would be used confidentially for research purposes only. The researcher ensured anonymity and confidentiality of the subjects' data, and participants were allowed to withdraw at any time. A reasonable incentive stipend, within the research ethical considerations, was provided to balance for their time, transportation, and logistics.

Pilot Study

A pilot study was carried out to evaluate the tools' clarity and applicability on (10%) of the study participants. While the research tools were not modified, those who participated in the pilot study were included in the study.

Statistical Design:

The study utilized IBM SPSS version 27 for data analysis, including descriptive statistics and inferential statistics. The paired test was used to compare quantitative differences between pre-posttests. The level of significance was determined at a p-value of 5%.

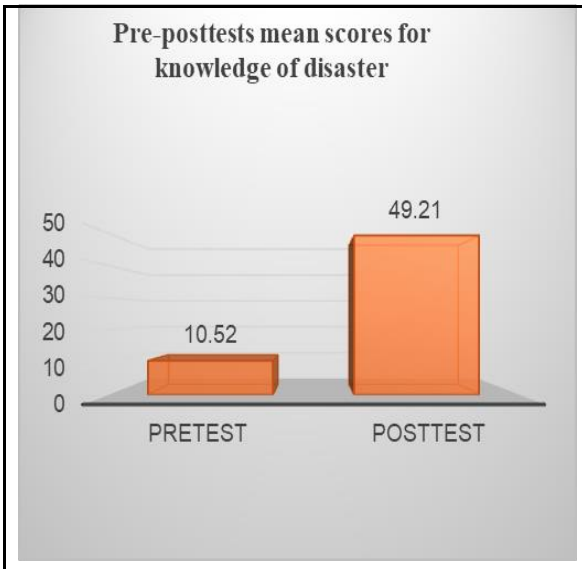
Table (1): Training Modules Objectives, Topics, Teaching Methods and Activities, Materials Required, and Methods of Assessment

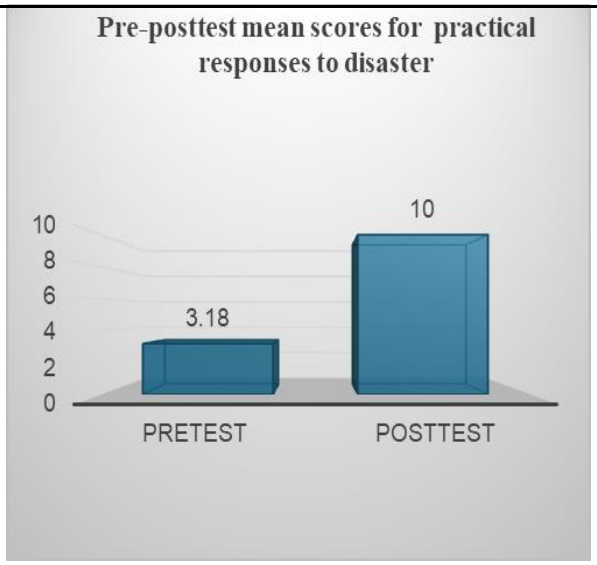
Training Module	Objectives	Topics	Teaching Methods & Activities	Materials Required	Methods of Assessment
Disaster & Climate Change Preparedness	To educate on disasters, climate change impacts, and emergency response	Types of disasters, climate change,	Interactive lectures, group discussion, case studies, role-playing	Flipcharts, handouts, projector, videos	Pre- and post-test, observational checklist
		Emergency response and safety protocols	Demonstrations	Fire extinguisher	
Basic First Aid & Emergency Situations	To provide essential first aid skills for common and life-threatening emergencies	CPR, bleeding, fractures, shock, burns, heatstroke, hypothermia, choking, allergic reactions, poisoning, and other relevant emergency situations	Interactive lecture, group discussion, case studies, role-playing Demonstrations, hands-on practice,	Flipcharts, handouts, projector, videos	Pre- and post-test, practical skill observation
Psychological First Aid	To provide basic skills in offering mental health support in emergencies	Stress management, calming techniques, listening skills	Interactive lectures, group discussion, case studies, role-playing, relaxation exercises	Handouts, stress relief tools	Pre- and post-test, observation of techniques

Results:

Table (2): Demographic Characteristics of Trained Sanitation Workers at Railways (n=66)

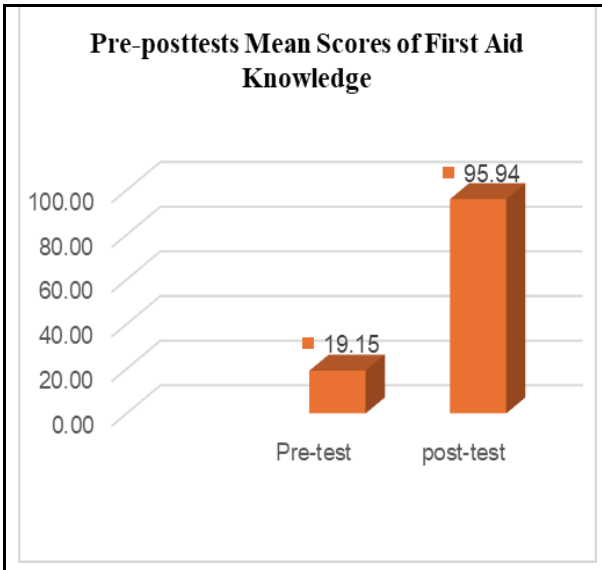
Variables	No.	%
Age		
Min - Max	40- 51	
Range	11	
Mean± SD	45.41±4.31	
Sex		
Male	50	75.8
Female	16	24.2
Literacy level (can read and write)		
No	66	100
Marital status		
Married	60	90.9
Widow	6	9.1
Years of work experience		
Min - Max	10 - 27	
Range	17	
Mean± SD	18.61±5.24	
Income (formal and informal such as tip)		
Not Enough	46	69.7
Enough	20	30.3
Previous training on Basic First aid		
No	66	100
Previous training on Psychological First aid		
No	66	100
Previous training on Climate change and disaster		
No	66	100
Previous training on occupational hazards		
No	27	40.9
Yes	39	59.1

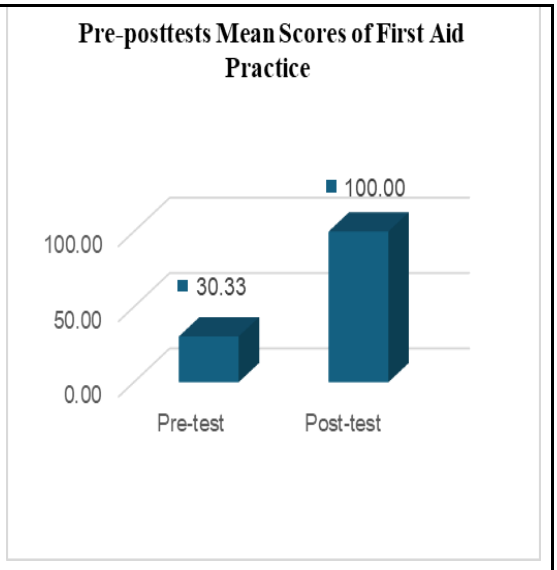




Variable	Mean ± St. Deviation		Paired Sample Test	
	Pre-test	Post-test	T test	P-value
Knowledge	10.52±3.50	49.21±0.85	84.87	0.000 (s)*
Practice	3.18±2.42	10.00±0.00	22.85	0.000 (s)

Figure (1): The differences in mean scores of pre-post-tests on disaster knowledge and practice among trained sanitation workers at railways (n=66)

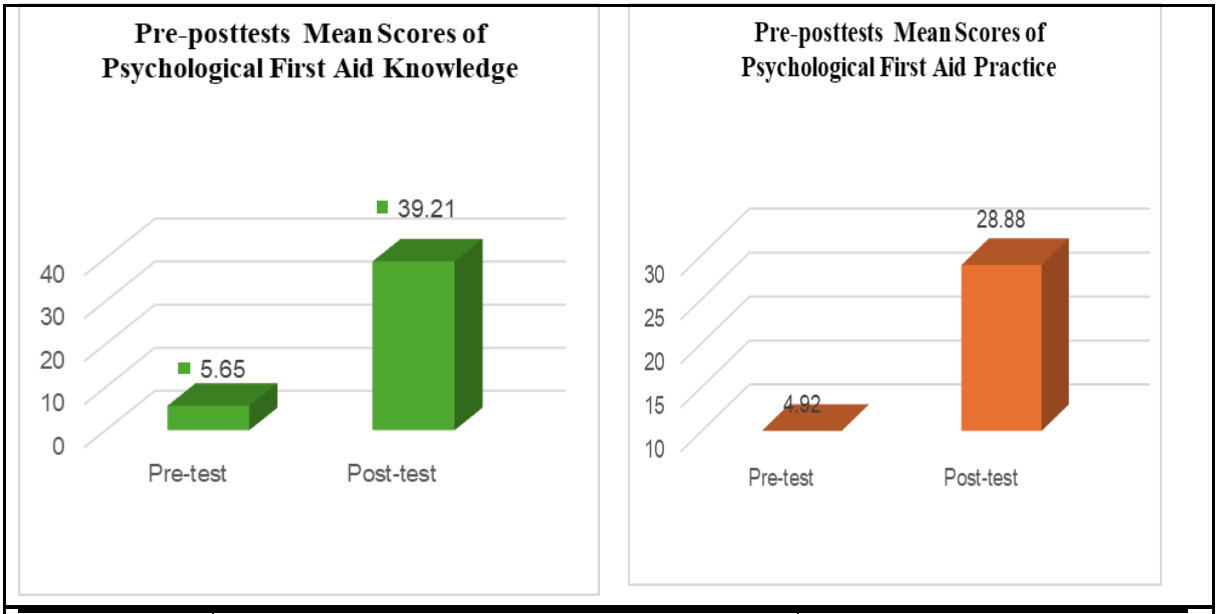




Variable	Mean ± St. Deviation		Paired Sample Test	
	Pre-test	Post-test	T test	P-value
Knowledge	19.15±3.70	95.94±4.14	106.672	0.000 (s)*
Practice	30.33±5.35	100.00±0.00	105.841	0.000 (s)

(s) statistical significance*

Figure (2): Differences in mean scores of pre-post-tests on First Aid Responses knowledge and practice in emergency situations among trained sanitation workers at railways (n=66)



Variable	Mean ± St. Deviation		Paired Sample Test	
	Pre-test	Post-test	T test	P-value
Knowledge	5.65±2.52	39.21±1.55	104.762	0.000 (s)*
Practice	4.92±1.78	28.88±2.22	67.715	0.000 (s)

(s) statistical significance*

Figure (3): Differences in mean scores of pre-post-tests on Psychological First Aid Responses knowledge and practice among trained sanitation workers at railways (n=66)

Table (2): Reveals the demographic data of sanitation workers at Egyptian Railways two quarters (75.8%) were male. The participants' mean age was 45.41 years, with a range of 40 to 51 years. Moreover, all participants were literate. The majority, 90.9%, were married. They had work experience, with an average of 18.61 years. However, most report insufficient income, none of them had prior training in basic first aid, psychological first aid, or disaster preparedness, but 59.1% had received training on occupational hazards.

Figure (1): Demonstrates a significant improvement in both disaster knowledge and practice among the sanitation workers at Egyptian Railways following the training. For knowledge, the mean score increased from 10.52 (±3.50) in the pre-test to 49.21 (±0.85) in the post-test, with a T-test value of 84.87 and a p-value of 0.000, indicating a statistically significant improvement ($p < 0.05$). Similarly, for practice, the mean score increased from 3.18 (±2.42) in the pre-test to a perfect score of 10.00 (±0.00) in the post-test, with a T-test value of 22.85 and a p-value of 0.000, showing significant improvement.

Figure (2): Illustrates a significant improvement in both the knowledge and practice of first aid responses in emergency situations among the sanitation workers after the training. The mean score for knowledge increased from 19.15 (±3.70) in the pre-test to 95.94 (±4.14) in the post-test, with a T-test value of 106.672 and a p-value of 0.000, indicating a highly statistically significant improvement ($p < 0.05$). Similarly, for practice, the mean score rose from 30.33 (±5.35) in the pre-test to a perfect score of 100.00 (±0.00) in the post-test, with a T-test value of 105.841 and a p-value of 0.000, also showing a significant enhancement in practical skills.

Figure (3): Highlights the substantial improvement in both knowledge and practice related to Psychological First Aid (PFA) responses among the sanitation workers following the training. For knowledge, the mean score increased from 5.65 (±2.52) in the pre-test to 39.21 (±1.55) in the post-test, with a T-test value of 104.762 and a p-value of 0.000, indicating a highly statistically significant improvement ($p < 0.05$). Similarly, for practice, the mean score increased from 4.92 (±1.78) in the pre-test to 28.88 (±2.22) in the post-test, with a T-test value of 67.715 and a p-value of 0.000, demonstrating a statistically significant enhancement in practical psychological first aid.

Discussion:

The outcomes of this study reveal a significant improvement in both theoretical understanding and practical competencies related to basic first aid, psychological first aid, and disaster management among sanitation workers at Egyptian Railways

following a structured training program conducted in the nursing skill lab at the College of Nursing. These findings support the study's hypothesis, which anticipated that post-training scores for knowledge and practice would significantly surpass pre-training levels. The training effectively addressed the participants' lack of prior exposure to these critical areas, emphasizing the necessity of tailored educational initiatives for high-risk occupational groups.

Demographic data indicated that the majority of participants were male, married, and possessed considerable work experience, yet none had previously received training in first aid or disaster preparedness. This highlights a significant gap in their professional development, particularly given their role in high-risk environments such as railways. While participants were literate and some had undergone training on occupational hazards, the absence of formal first aid or disaster preparedness training underscores the need for targeted interventions. Additionally, the reported financial constraints among most participants suggest that economic barriers may have previously limited their access to such training opportunities **(Ersing & Caruson., 2017; Michaels & Barab., 2020).**

The substantial improvements in both knowledge and practical skills across all domains—basic first aid, disaster preparedness, and psychological first aid—demonstrate the effectiveness of the training program. Notably, participants achieved near perfect or perfect scores in practical skills post-training, reflecting their ability to apply theoretical knowledge in real-world scenarios. This is particularly critical for sanitation workers, who often serve as first responders during emergencies and play a pivotal role in public health and safety **(First Aid IFRC., 2022; OSHA, n.d.).**

The success of the training can be attributed to its comprehensive design, which integrated theoretical instruction with hands-on practice in a controlled environment such as the nursing skill lab. This approach likely fostered a supportive learning atmosphere, enabling participants to build confidence and competence in their skills. The inclusion of psychological first aid training is especially significant, as it addresses the emotional and psychological dimensions of disaster response, which are often neglected but essential for both responders and affected individuals **(Birkhead & Vermeulen., 2018; Wang et al., 2021; Hermosilla et al., 2022; Carmen Amaia Ramírez-Torres et al., 2023; & Chelliah., 2024).**

These findings carry important implications for policy and practice. They suggest that similar training programs should be expanded to other high-risk occupational groups who may lack formal emergency response training. Incorporating such programs into routine professional development initiatives could help sustain and reinforce these skills over time. Future research should explore the long-term retention of these skills and their practical application in real-world emergency scenarios **(Michaels & Barab., 2020; Health, Safety and Dignity of Sanitation Workers an Initial Assessment., 2019; & Health and Safety of Sanitation Workers - Humanitarian Sanitation Hub., 2024).**

Conclusion

In conclusion, the training program successfully improved the knowledge and practical skills of sanitation workers in basic first aid, psychological first aid, and disaster preparedness. These results highlight the value of targeted educational interventions in enhancing emergency response capabilities among frontline workers, ultimately contributing to safer and more resilient communities.

Recommendations:

Given the positive impact of training, it is recommended that similar initiatives be institutionalized within national railway systems and extended to other high-risk occupations, such as waste collectors, maintenance staff, and transit personnel. Training should be recurrent to ensure long-term retention and to adapt to evolving protocols and risks. Partnerships with public health institutions, nursing faculties, and disaster preparedness agencies can support scalability and sustainability. Policymakers and railway authorities are encouraged to integrate emergency preparedness training into routine onboarding and professional development frameworks. Furthermore, mobile or on-site refresher modules can help overcome logistical barriers, especially for employees in decentralized locations.

Limitations of the study:

While the study provides promising insights, there are several limitations that must be acknowledged. First, the sample size was relatively small and geographically restricted to three railway stations, which may limit the generalizability of the findings. Second, the post-training assessments only measured short-term gains; long-term knowledge retention and the application of skills in actual emergency settings were not assessed. Future research should include longitudinal follow-up and potentially incorporate real-time simulations or field evaluations.

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