

Dimensions of Preparedness: A Principal Component Analysis of Security Officers' Emergency Response During Fire Drills

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Abstract

Despite existing safety protocols, many organizations experience gaps in fire emergency preparedness, particularly among frontline security personnel who are often the first responders during fire incidents. Previous incidents have highlighted issues such as delayed response, inadequate coordination, and limited emergency skills among security teams, reflecting a need for systematic evaluation of preparedness factors. This study aims to identify and validate the underlying dimensions influencing the preparedness of security personnel in responding to fire emergencies during drills. Data were collected from 445 respondents across various organizational settings using a random sampling method to ensure representativeness and reduce selection bias. Analysis was conducted using Exploratory Factor Analysis (EFA) via Principal Component Analysis (PCA) with Varimax rotation. The data analysis revealed eleven (11) core constructs comprising 54 validated items with factor loadings exceeding the threshold and communalities greater than 0.30. These constructs are Emergency Preparedness on Planning, Fire Protection System, Fire Risk Reduction, Incident Command System & ERT, Leadership, Communication in Fire Emergency, Fire Emergency Training, Awareness and Education, Responders' Emergency Response Capabilities, Organizational Commitment, and Effectiveness of Fire Drill Preparedness. Each construct contains 4 to 6 items, collectively capturing behavioral, procedural, and organizational aspects of fire emergency readiness. The findings underscore the multifaceted nature of emergency preparedness and provide a robust empirical basis for developing a comprehensive and structured fire emergency management framework tailored for security personnel in the workplace. These validated dimensions can inform policy, training, and operational strategies to enhance organizational resilience and response efficacy.

Keywords: Emergency preparedness, fire drill, security personnel, exploratory factor analysis (EFA).

1. INTRODUCTION

Workplace fire emergencies present a critical threat to life, property, and the continuity of organizational operations. In such high-risk situations, security personnel demonstrated their skill and knowledge in initiating evacuation procedures, coordinating with emergency services, and ensuring an orderly and efficient response to minimize harm [1, 2]. Due to the unpredictable and rapidly evolving nature of fire incidents, maintaining a high level of preparedness among these frontline personnel is crucial to reduce casualties and property damage [3, 4]. In recent years, organizations have increased awareness of fire emergency preparedness by implementing safety protocols, emergency response plans, and regular drills to ensure readiness among all employees, especially those on the frontline. However, despite these formal measures, many incidents reveal significant gaps in actual preparedness. In fire incidents, reports of communication breakdowns, poor coordination, and confusion during evacuations have resulted in delayed responses and elevated risks [5, 6]. These challenges highlight that effective fire emergency preparedness goes beyond having documented procedures. Fire incident procedures rely heavily on protocols understood, practiced, and executed by security personnel.

Extensive literature suggests that fire emergency preparedness is influenced by behavioral, procedural, and systemic factors, including individual readiness, adequacy of training, organizational support, and clarity in communication channels [7, 8]. Johannes and Koray [9] found that the majority of respondents, i.e., healthcare workers, lack adequate knowledge of emergency preparedness level and fire safety. While many studies have explored general emergency preparedness, there is a distinct lack of empirical research focusing specifically on the security personnel during fire emergency preparedness. Security personnel are often the first line of defense in fire situations, and their preparedness can significantly determine the outcome of such emergencies [10]. Organizations frequently assume that the safety protocols and periodic drills equate presence to sufficient readiness, without evaluating the actual competence and key responders' skills. Deficiencies such as insufficient specialized training, limited knowledge of emergency procedures, and ineffective coordination mechanisms remain persistent issues that undermine response effectiveness [11, 12].

Given the ongoing operational gaps, especially among security personnel expected to act swiftly and efficiently during fire emergencies, there is a critical need for a systematic investigation into the factors influencing their preparedness. Without a clear understanding of these underlying dimensions, efforts to enhance emergency response strategies may fall short. This study seeks to fill this gap by identifying and analyzing the key dimensions of fire emergency preparedness among security personnel using Exploratory Factor Analysis (EFA). The findings aim to provide valuable empirical insights to inform targeted training programs, policy development, and organizational planning to strengthen fire emergency readiness at the workplace.

2. LITERATURE REVIEW

2.1 Emergency preparedness

Emergency preparedness refers to the measures taken to anticipate, prepare for, respond to, and recover from disasters and emergencies [13, 14]. These measures include comprehensive planning, regular training, efficient resource management, and clear communication strategies. In the context of fire emergency readiness at the workplace, preparedness ensures that employees know how to respond quickly and appropriately, thereby minimizing injury, property damage, and business disruption. A well-prepared organization can significantly mitigate risks, reduce response time, and protect human life and infrastructure. According to the findings of Park et al. [15], improving the efficiency of fire emergency services necessitates the implementation of comprehensive and well-structured preparedness frameworks. Key strategies include optimizing the geographical distribution of fire stations or safety centers, enhancing the allocation of personnel and equipment, and fostering more robust interagency coordination. Furthermore, strengthening preventive measures and expanding public education programs are essential components. The policy recommendations implementation to significantly enhance the operational effectiveness and responsiveness of fire emergency services, while simultaneously minimizing the occurrence and severity of life-threatening emergencies. Fire emergency readiness is most effective when it includes regular fire drills, visible signage, accessible extinguishers, and designated emergency roles. Fire drills, in particular, are crucial practical exercises that simulate real emergency scenarios, helping staff internalize evacuation procedures and identify potential weaknesses in the emergency plan. Organizations or individuals with experience in fire evacuation training tend to have faster evacuation times, safety procedures, and perceived personal responsibility in fire safety, and improved employee confidence during emergencies [16].

Besides, the role of security personnel has become increasingly important in ensuring emergency preparedness. Trained security staff often serve as the first responders during fire incidents, taking charge of crowd control, initiating alarm systems, and guiding evacuation procedures. Security personnel who have attended emergency response training can significantly improve safety and prepare to assess the situation quickly, communicate effectively with emergency services, evacuate people safely, and provide first aid until professional help arrives [17, 18, 19]. Several key factors influence the level of emergency preparedness in the workplace. These include the organization's safety culture, the availability of resources (such as equipment and emergency exits), staff awareness, leadership commitment, and previous experience with emergencies. Emergency preparedness is crucial for maintaining operational continuity, minimizing legal risks, and strengthening the organization's public reputation. In high-risk industries such as manufacturing, healthcare, and education, preparedness is a core component of occupational safety and health management systems. Moreover, a prepared workforce is more confident and less likely to panic, enabling a more coordinated and effective response during emergencies.

2.2 Fire Drill

Fire drills are structured training simulations designed to prepare building occupants for safe, efficient, and orderly evacuation during actual fire emergencies. Fire evacuation drills are crucial to provide valuable hands-on emergency experience for responding in a real emergency case, although every evacuation process was challenging [20]. They replicate potential fire scenarios in a controlled environment to help individuals understand emergency procedures, evacuation routes, and safety protocols. Fire drills should be scheduled regularly to ensure that employees are prepared for a real fire. Fire drills are a fundamental component of workplace and institutional fire safety programs. Fire evacuation drills function is to reduce confusion and panic while enhancing occupants' ability to respond calmly and appropriately in real emergencies. Well-executed fire drills contribute to injury prevention, safeguard lives, and ensure

smoother coordination among personnel during evacuations [21]. As such, they serve not only as a preparedness tool but also as a means to test and refine existing emergency response plans.

In the Malaysian context, fire drills are increasingly recognized as a crucial element in institutional and workplace safety programs. A study by Yusof et al. [22] establishes a conceptual framework for fire safety management plans in Malaysian Higher Educational institutions. The research highlighted that the concept of fire disaster preparedness and response in universities has not been sufficiently explored. However, the study found that the key elements of fire safety variables are organizational responsibilities (mitigation/prevention), emergency preparedness, including emergency facilities, emergency contact details, information, and communication training, and testing and reviewing (response & recovery). These local findings align with international research, underscoring that fire drills must be systematic, inclusive, and supported by institutional commitment to be truly effective. In Malaysia, there is a growing call for the integration of digital tools and mandatory fire safety modules, particularly in high-occupancy buildings such as universities, hospitals, and factories.

2.3 Security Personnel

A security officer is an individual who functions as the primary contact for security services and activities within a facility and is responsible for maintaining a safe and secure environment by preventing criminal acts [23, 24]. A security guard plays a vital role in assisting guests, offering information, and providing directions. A security officer monitors and documents any suspicious activity. Regular patrols, scrutinizing surveillance equipment like cameras and systems, and conducting security inspections form the cornerstone of this role [25]. The security officer is derived from the organization they serve and is generally limited to preventing or stopping criminal acts within their presence. Proper training and adherence to organizational policies are essential for their effective functioning. A security officer's failure to act following their authority can result in disciplinary action, criminal charges, or civil liability for both the officer and their employer.

Additionally, joint emergency drills involving security personnel and external emergency services (e.g., bomba, paramedics, police) have been shown to enhance inter-agency communication, clarify roles and responsibilities, and improve overall preparedness. These collaborative efforts reduce role ambiguity and foster a more unified command structure during real crises. In the Malaysian context, the involvement of security teams in emergency planning is increasingly emphasized in institutional guidelines and workplace safety standards. However, there is still a need for more structured frameworks for integrating security personnel into emergency response plans. Continuous professional development, legal recognition of their emergency roles, and investment in advanced training programs are necessary to further enhance their effectiveness.

3. METHODOLOGY

3.1 Research Design

This study employed a quantitative research design using a cross-sectional survey method. The primary objective was to identify and validate the underlying dimensions that influence the preparedness of security personnel in responding to fire emergencies during drills. The design was chosen to enable the collection of numerical data suitable for factor analysis, thereby allowing the exploration of latent constructs underpinning fire emergency preparedness.

3.2 Population and Sampling

The population of this study comprised security personnel working across various organizational settings in Malaysia. A random sampling method was used to ensure representativeness and to minimize selection bias. A total of 445 respondents participated in the study. This sample size exceeds the minimum threshold for factor analysis, ensuring the robustness of statistical inferences [26].

3.3 Research Instrument

A structured questionnaire was developed based on existing literature and expert input in the field of fire safety and emergency management. The instrument initially included items related to various aspects of fire emergency preparedness, including planning, training, leadership, and communication. Respondents rated the items using a 4-point Likert scale as follows: 1 = Strongly Disagree, 2 = Disagree, 3 = Agree, and 4 = Strongly Agree. This forced-choice scale design was employed to avoid central tendency bias and to encourage clearer distinctions in respondent attitudes and perceptions.

3.4 Data Collection Procedure

Data collection was carried out through self-administered surveys distributed both in paper and digital formats. Ethical considerations such as informed consent, anonymity, and voluntary participation were strictly observed throughout the data collection process. Respondents were briefed on the purpose of the study and assured of data confidentiality.

3.5 Data Analysis

Data were analyzed using Exploratory Factor Analysis (EFA) to uncover the underlying structure of the constructs. The analysis was conducted using Principal Component Analysis (PCA) with Varimax rotation to achieve a simpler and more interpretable factor structure. Items with factor loadings below 0.40 and communalities less than 0.30 were excluded to ensure the validity of retained items.

3.6 Validity and Reliability

Reliability analysis was conducted using Cronbach's Alpha coefficient for each construct involved to ensure the internal consistency of the questionnaire instrument used in this study.

Table 1: Cronbach's Alpha Values

Construct	Alpha	No. of Items	Reliability Level
QS1A – QS1E	0.924	5	Very High
QS2A – QS2E	0.921	5	Very High
QS3A – QS3E	0.903	5	Very High
QS4A – QS4E	0.927	5	Very High
QH1A – QH1E	0.911	5	Very High
QH2A – QH2D	0.923	4	Very High
QH3A – QH3D	0.938	4	Very High
QH4A – QH4D	0.930	4	Very High
QH5A – QH5E	0.915	5	Very High
QM1A – QM1F	0.934	6	Very High
QL1A – QL1F	0.919	6	Very High

The reliability table shows that the Cronbach's Alpha values for 11 sets of constructs range from 0.903 to 0.938. This indicates that all constructs exhibit very high reliability. These findings suggest that each construct demonstrates strong internal consistency, meaning that every set of questions measures a single construct effectively. With 445 respondents providing consistent feedback, there is no evidence of confusion or misunderstanding in the comprehension of the items. The results indicate that there is no need to remove or add items at this stage, as no item weakens the construct's reliability. Overall, the findings confirm that the research instrument has very high reliability, making it suitable for use in actual research. The Cronbach's Alpha values exceeding 0.90 further attest to the stability, consistency, and precision of all constructs in measuring the intended dimensions. These procedures confirmed that the instrument is valid and reliable for assessing fire emergency preparedness among security personnel.

4. RESULTS AND DISCUSSIONS

The respondents of this study comprised 445 individuals, all of whom served as security personnel actively involved in fire emergency drills at their respective workplaces. Their direct participation in simulated emergency scenarios provided valuable insights into real-world preparedness, decision-making under pressure, and operational effectiveness during fire incidents. This purposive sample was selected due to their frontline roles and hands-on experience, making them highly relevant for evaluating the critical factors influencing fire emergency preparedness and response effectiveness.

4.1 Preliminary Assessment for Exploratory Factor Analysis (EFA)

Before conducting the Exploratory Factor Analysis (EFA), preliminary tests were performed to assess the suitability of the dataset. Two statistical measures were used: the Kaiser-Meyer-Olkin (KMO) Measure of Sampling Adequacy and Bartlett's Test of Sphericity. The KMO statistic evaluates the proportion of variance among variables that might be common variance, while Bartlett's test examines whether the correlation matrix is significantly different from an identity matrix. The results of both tests are presented in Table 2.

Table 2: KMO and Bartlett's Test

Kaiser-Meyer-Olkin Measure of Sampling Adequacy.	0.846
Bartlett's Test of Sphericity Approx. Chi-Square	33534.408
df	1431
Sig.	0.000

Table 3: Summary of the uniformity (communalities)

No.	Construct	Communalities	Result	No.	Construct	Communalities	Result
1.	QS1A	0.784	Accepted	28.	QH2C	0.962	Accepted
2.	QS1B	0.701	Accepted	29.	QH2D	0.967	Accepted
3.	QS1C	0.774	Accepted	30.	QH3A	0.831	Accepted
4.	QS1D	0.737	Accepted	31.	QH3B	0.908	Accepted
5.	QS1E	0.806	Accepted	32.	QH3C	0.896	Accepted
6.	QS2A	0.687	Accepted	33.	QH3D	0.895	Accepted
7.	QS2B	0.684	Accepted	34.	QH4A	0.984	Accepted
8.	QS2C	0.590	Accepted	35.	QH4B	0.981	Accepted
9.	QS2D	0.672	Accepted	36.	QH4C	0.985	Accepted
10.	QS2E	0.625	Accepted	37.	QH4D	0.988	Accepted
11.	QS3A	0.976	Accepted	38.	QH5A	0.864	Accepted
12.	QS3B	0.891	Accepted	39.	QH5B	0.935	Accepted
13.	QS3C	0.979	Accepted	40.	QH5C	0.910	Accepted
14.	QS3D	0.983	Accepted	41.	QH5D	0.959	Accepted
15.	QS3E	0.986	Accepted	42.	QH5E	0.920	Accepted
16.	QS4A	0.961	Accepted	43.	QM1A	0.941	Accepted
17.	QS4B	0.950	Accepted	44.	QM1B	0.837	Accepted
18.	QS4C	0.960	Accepted	45.	QM1C	0.848	Accepted
19.	QS4D	0.953	Accepted	46.	QM1D	0.934	Accepted
20.	QS4E	0.928	Accepted	47.	QM1E	0.930	Accepted
21.	QH1A	0.748	Accepted	48.	QM1F	0.932	Accepted
22.	QH1B	0.808	Accepted	49.	QL1A	0.791	Accepted
23.	QH1C	0.831	Accepted	50.	QL1B	0.818	Accepted
24.	QH1D	0.802	Accepted	51.	QL1C	0.767	Accepted
25.	QH1E	0.790	Accepted	52.	QL1D	0.853	Accepted
26.	QH2A	0.966	Accepted	53.	QL1E	0.782	Accepted
27.	QH2B	0.962	Accepted	54.	QL1F	0.800	Accepted

Extraction Method: Principal Component Analysis.

The results of the study in Table 3 found that 54 items for Emergency Preparedness on Planning, Fire Protection System, Fire Risk Reduction, Incident Command System & ERT, Leadership, Communication in Fire Emergency, Fire Emergency Training, Awareness and Education, Responders' Emergency Response Capabilities, Organizational Commitment, and Effectiveness of Fire Drill Preparedness elements have a uniformity value (communalities) exceeding 0.30 (≥ 0.30). Therefore, the analysis of Principal Component Analysis (PCA) as in the component matrix found that 54 items of collaboration learning construct for fire emergency management in workplace elements were accepted.

i. Bartlett's Test of Sphericity

Chi-Square (χ^2) $\approx$ 7448.259, Degrees of Freedom (df) = 1431. The degrees of freedom (df) are calculated based on the number of variables using the formula:

$$df = \frac{p(p-1)}{2}$$

Where p = number of items. Solving for p:

$$1431 = \frac{p(p-1)}{2} \rightarrow p = 54$$

This result means the factor analysis was conducted on 54 items. Therefore, data meets the assumptions required to proceed to the next steps in EFA (factor extraction and rotation).

ii. Kaiser-Meyer-Olkin (KMO) Measure of Sampling Adequacy

Kaiser-Meyer-Olkin (KMO) = 0.846. This value indicates that data in this research is highly suitable for factor analysis. According to Kaiser (1974), values above 0.80 (≥ 0.80) are considered "meritorious", meaning the sampling is adequate and patterns of correlations are compact enough to yield distinct and reliable factors.

Table 3, the value of communalities shows the variance ratio of the variables explained by the elements. The value of uniformity (communalities) usually needs to be ≥ 0.30 as suggested by Hair et al. (2010).

4.2 Exploratory Factor Analysis (EFA) Summary Report

An Exploratory Factor Analysis (EFA) was conducted using the Principal Component Analysis extraction method with Varimax rotation. The purpose was to identify the underlying factor structure of items related to fire emergency preparedness and response within organizations.

Table 4: Rotated Component Matrix^a

	Component										
	1	2	3	4	5	6	7	8	9	10	11
QH5 C	.959										
QH5 D	.941										
QH5 E	.910										
QH5 B	.871										
QH5 A	.848										
QS3E		.989									
QS3D		.985									
QS3A		.984									
QS3C		.983									
QS3B		.948									
QM1 E			.952								
QM1 A			.948								
QM1 F			.946								
QM1 D			.945								
QM1 B			.909								
QM1 C			.888								
QL1D				.906							
QL1F				.887							

QL1E				.860							
QL1B				.859							
QL1C				.834							
QL1A				.831							
QS4B					.985						
QS4C					.971						
QS4A					.970						
QS4E					.969						
QS4D					.956						
QS1E						.900					
QS1A						.884					
QS1C						.866					
QS1D						.831					
QS1B						.818					
QH4 C							.984				
QH4 D							.981				
QH4 A							.979				
QH4 B							.977				
QS2B								.818			
QS2D								.796			
QS2A								.793			
QS2C								.765			
QS2E								.744			
QH2 D									.983		
QH2 B									.950		
QH2 C									.947		
QH2 A									.939		
QH1 C										.920	
QH1 B										.881	
QH1 D										.854	
QH1 E										.792	
QH1 A										.791	
QH3 D											.891
QH3 C											.865
QH3 B											.829
QH3 A											.788

Extraction Method: Principal Component Analysis.

Rotation Method: Oblimin with Kaiser Normalization.^a

a. Rotation converged in 8 iterations.

Based on the results of the exploratory factor analysis (EFA), a total of 11 factors were successfully extracted, consistent with the initial expectations of the study. Each item demonstrated a high loading on a single factor, with most values exceeding 0.7, indicating good discriminant validity among the constructs. Furthermore, no significant cross-loadings were observed, as each item loaded strongly on only one factor without overlapping with others. This suggests a clear, clean, and well-defined factor structure, thereby supporting the structural validity of the instrument used in this study.

4.3 Factor Structure Based on Exploratory Factor Analysis (EFA)

The factor structure of the data collected from the fire emergency preparedness questionnaire was analyzed using Exploratory Factor Analysis (EFA) with Varimax rotation. This analysis identified key constructs that represent the critical components of fire emergency preparedness and response among security personnel. Table 5 presents the identified constructs along with their corresponding item statements, which highlight the various domains contributing to effective fire emergency management in the workplace.

Table 5: Factor Structure Derived from Exploratory Factor Analysis Using Varimax Rotation

Factor	Construct Name	Item Code	Item Statement
1	Responders' Emergency Response Capabilities	QH5A	I seek to master the knowledge and skills in performing my duties well in fire emergency.
		QH5B	I am able to act calmly and respond in a timely manner to the emergency.
		QH5C	I report immediately of any unsafe condition/hazard to my team leader during fire drill.
		QH5D	I always inspect the PPE and working tools in good order before use.
		QH5E	I feel upset when my ideas and feedback to improve fire emergency matters to the Management is rejected.
2	Fire Risk Reduction	QS3A	Management conduct fire risk assessment program.
		QS3B	Management contain fire risk by proper storage of flammable materials away from fuel source.
		QS3C	Management prohibit smoking at workplace except in designated smoking areas.
		QS3D	Management ensure all the electrical appliances and power source are well maintained and functioning properly.
		QS3E	Management take corrective action to remove any unsafe condition/practices reported.
3	Organization Commitment	QM1A	Management institutionalize and comply with government's fire emergency policy and regulations.
		QM1B	Management provide sufficient funding and logistic support for fire emergency.
		QM1C	Management establish fire safety and health committees for consultation/feedback to manage fire emergency.
		QM1D	Management acts quickly to investigate and resolve the problem when accidents occurred.
		QM1E	Management recognize and reward for good performance.
		QM1F	Management takes care of my fire safety and security needs at workplace.
4	Effectiveness of Fire Drill Preparedness	QL1A	The target set for the fire drill evacuation time can be achieved?
		QL1B	The operation of fire alert and protective system are well managed?
		QL1C	Do you receive clear decision and instruction from the Incident Commander and team leaders?

Factor	Construct Name	Item Code	Item Statement
5	Incident Command System & ERT	QL1D	You have been briefed by your team leader on the coordination with internal and external emergency agencies efficiently?
		QL1E	Are the emergency PPE and equipment issued to you for fire emergency task?
		QL1F	Does the knowledge and skill set attained from training assist you in the fire drill?
		QS4A	Management implements Emergency Response Plan (ERP) and ICS.
		QS4B	Management clearly spelt out ICS and ERT's roles & responsibility in fire emergency.
6	Emergency Preparedness Planning	QS4C	Management establishes an Emergency/Security Operation Centre (EOC) with adequate communication and monitoring devices.
		QS4D	ICS and ERT coordinates well with external emergency agencies in managing fire emergency response.
		QS4E	Management prepared employees as floor marshals to mobilise as emergency responders for fire drill.
		QS1A	Management implement emergency evacuation plan for fire drill.
		QS1B	The fire emergency response and evacuation procedure is transmitted to all staff.
7	Awareness and Education	QS1C	Management set target for fire drill evacuation response time.
		QS1D	Management displays appropriate "Keluar" sign and escape routes plan at workplace.
		QS1E	Management regularly conducts fire risk inspection on building.
		QH4A	Management promotes fire safety and health awareness activities at workplace.
		QH4B	Management conducts orientation on fire protection system and use of fire extinguisher to new security personnel/contractors.
8	Fire Protection System	QH4C	Employees are educated on safety and health practices in first aid and occupational safe work system relevant to their jobs.
		QH4D	There are adequate fire safety and hazards precautionary information for me to perform my task in fire emergency.
		QS2A	Management installed fire alarm and PA system to alert the staff and public to evacuate.
		QS2B	Management installed and maintained sufficient fire extinguishers.
		QS2C	Management has regularly serviced the fire protection and alarm system.
9	Communication in Fire Emergency	QS2D	Management display emergency contact numbers.
		QS2E	I feel safe to do my job at workplace with the fire protection system installed.
		QH2A	Management implement clear crisis communication plan.
		QH2B	There is effective two ways communication from the ICS.
		QH2C	Management transmits accurate and timely information.
10	Leadership	QH2D	Management provide appropriate IT platforms such as WhatsApp.
		QH1A	Team leader sets target performing the fire evacuation task.
		QH1B	Team leader makes clear decisions to resolve problems in fire emergency situation.
		QH1C	Team leader briefs the responders on how the tasks should be carried out.

Factor Construct Name			Item Code	Item Statement
			QH1D	Team leader listens and seeks feedback from team members to improve interactions with other agencies during fire drill.
			QH1E	Team leader takes responsibility and intervene when a team member fails to perform their task.
11	Fire Training	Emergency	QH3A	Management conducts annual fire drill and involves employees.
			QH3B	Management organizes fire safety programs.
			QH3C	Security responders are trained to respond to changing situations.
			QH3D	I am trained to assist in the evacuation.

Table 5 presents the factor structure derived from Exploratory Factor Analysis (EFA) using the Varimax rotation method, conducted on questionnaire data related to fire emergency preparedness and response among security personnel. The analysis identified eleven (11) key constructs representing critical domains fire emergency management in workplace. The first construct, Responders' Emergency Response Capabilities, assesses individual competencies in performing duties during emergencies, such as mastery of relevant knowledge, the ability to remain calm, hazard reporting, and inspection of safety equipment. The second construct, Fire Risk Reduction, reflects the organization's efforts in preventing fire incidents through risk assessments, control of flammable materials, and maintenance of electrical equipment. The third construct, Organizational Commitment, emphasizes management's support through safety policies, financial allocation, establishment of safety committees, and actions taken in response to incidents. The fourth construct, Effectiveness of Fire Drill Preparedness, evaluates the implementation of fire drills, clarity of instructions, provision of personal protective equipment, and learning outcomes from training. The fifth construct, Incident Command System and Emergency Response Team (ERT), measures the effectiveness of emergency response plans, clarity of roles within the ICS and ERT, and coordination with external emergency agencies.

Additionally, the sixth construct, Emergency Preparedness Planning, assesses the implementation of evacuation plans, communication of procedures, and the visibility of emergency exit signage. The seventh construct, Awareness and Education, focuses on the management's efforts to educate and train employees on fire safety and safe work practices. The eighth construct, Fire Protection System, refers to the management's capability in installing and maintaining fire protection systems and providing emergency-related information. The ninth construct, Communication During Fire Emergency, examines the effectiveness of crisis communication plans, the accuracy and timeliness of information delivery, and the use of technological platforms. The tenth construct, Leadership, assesses the team leader's ability to make decisions, coordinate tasks, and take responsibility for team performance. Finally, the eleventh construct, Fire Emergency Training, measures the implementation of annual fire drills, awareness programs, and scenario-based training. These eleven constructs reflect the key components that contribute to effective fire emergency preparedness and management. They are a strong foundation for developing a holistic fire emergency management model within organizational settings.

5. CONCLUSIONS

This study successfully identified and validated eleven (11) key constructs that significantly influence the preparedness and response effectiveness of security personnel during fire emergency drills in workplace settings. Using Exploratory Factor Analysis (EFA) with Principal Component Analysis (PCA) and Varimax rotation, a total of 54 items were retained, each demonstrating strong factor loadings and communalities exceeding 0.30. The extracted constructs—covering dimensions such as emergency planning, fire protection systems, leadership, communication, risk reduction, and training—collectively form a comprehensive representation of the behavioral, procedural, and organizational elements crucial for fire emergency readiness. The results indicate a clear, robust, and well-defined factor structure with no significant cross-loadings, affirming the structural validity of the instrument. The findings highlight the multifaceted nature of fire emergency preparedness, emphasizing the need for a systematic, integrated approach that considers not only individual competencies but also institutional policies, leadership roles, and technical systems. Importantly, this study addresses existing gaps in emergency response capabilities, particularly among frontline security personnel who often serve as first responders during fire incidents.

By identifying these critical preparedness dimensions, the study contributes valuable empirical evidence to support the development of structured fire emergency management frameworks, tailored training programs, and informed policy interventions. In conclusion, the validated constructs provide a solid foundation for enhancing organizational resilience and improving emergency response strategies in the workplace. These findings can guide future initiatives aimed at building capacity, promoting safety culture, and ensuring effective emergency preparedness among security personnel across various organizational settings.

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