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YACHT HARBOURS FIRE PROTECTION PRACTICES AND REVIEW OF AWARENESS LEVEL

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ABSTRACT

This study aims to evaluate the awareness levels of yacht owners regarding fire protection practices in yacht harbours through a survey and aims to analyze the existing safety standards. Yacht harbours carry significant fire risks due to enclosed spaces, flammable materials and a dense population of boats. The research emphasizes the importance of enhancing fire safety awareness among yacht owners and yacht harbours managers in Türkiye. Conducted through a comprehensive literature review and surveys targeting yacht owners, the study identifies gaps in knowledge and practices. The findings reveal that while yacht owners are equipped with basic firefighting equipment, yachtmen in fire drills remains low. By offering recommendations to improve fire safety standards and promote a safety culture in yacht harbours, the study contributes to the protection of lives, property and infrastructure.

Keywords: Yacht harbour, fire, regulation, awareness
JEL Clasifications: Q53, L91, R41

YAT LİMANLARINDA YANGINDAN KORUNMAYA YÖNELİK UYGULAMALAR VE FARKINDALIK DÜZEYİNİN İNCELENMESİ

ÖZET

Bu çalışma, yat limanlarındaki yangın koruma uygulamalarına yönelik yatçıların farkındalık düzeyini bir anket yoluyla değerlendirilmeye çalışmakta ve mevcut güvenlik standartlarını analiz etmeyi amaçlamaktadır. Yat limanları, kapalı alanlar, yanıcı malzemeler ve yoğun tekne nüfusu nedeniyle önemli yangın riskleri taşımaktadır. Araştırma, Türkiye'deki yatçılar ve yat limanı yöneticileri arasında yangın güvenliği farkındalığının artırılmasının önemine dikkat çekmektedir. Kapsamlı bir literatür taraması ve yatçılara yönelik anketler ile yürütülen araştırma, bilgi ve uygulama eksikliklerini ortaya koymaktadır. Bulgular, yatçıların temel yangın güvenliği ekipmanlarına sahip olmasına rağmen, yangın tatbikatlarına katılım oranının düşük olduğunu göstermektedir. Çalışma, yangın güvenliği standartlarını iyileştirmek ve yat limanlarında güvenlik kültürünü teşvik etmek için öneriler sunarak, can, mal ve altyapı korumasına katkı sağlamaktadır.

Anahtar kelimeler: yat limanı, yangın, yönetmelik, farkındalık
JEL Sınıflandırması: Q53, L91, R41

1. INTRODUCTION

Fire safety in yacht harbours represents a critical concern for the maritime sector, given the potential for fire incidents to cause severe damage to property and threaten human life. Yacht harbours serve not only as essential docking facilities for vessels but also as hubs of economic activity within the maritime industry. The concentration of valuable assets such as yachts, equipment, and often dense populations, increases the susceptibility of these areas to fire-related emergencies. Given the confined spaces and the combustible nature of materials present in yacht harbours, fires can spread rapidly, making timely and effective responses essential for minimizing damage.

The objective of this study is to assess and improve the awareness of fire protection measures among individuals and organizations operating in yacht harbours, particularly in Türkiye. The research explores how various stakeholders—yachtsmen, harbour staff, and management—interact in terms of fire safety expectations and practices. These interactions are crucial in shaping the overall level of fire safety awareness and preparedness within yacht harbours, where both technical knowledge and behavioral responses play a vital role in preventing and addressing fires.

Despite the existence of various national and international fire safety regulations and standards in the maritime industry, there remains a significant gap in understanding how these measures are implemented in yacht harbours. This study, therefore, conducts a thorough review of relevant regulatory frameworks, focusing on the extent to which current practices align with these standards. The investigation aims to identify shortcomings in compliance and areas where improvements are necessary to elevate fire safety in yacht harbours.

To achieve its objectives, this research employs a mixed-methods approach, combining an extensive literature review with a survey targeting yachtsmen fire safety awareness. The survey examines not only the possession of safety equipment, such as fire extinguishers, but also the level of yachtmen in fire drills and other preventive training activities. Preliminary findings suggest that while most yachtsmen are equipped with the necessary firefighting tools, their practical knowledge and engagement in fire safety procedures are limited, indicating a need for more comprehensive and frequent training.

The significance of this study lies in its potential to contribute to both academic research and practical fire safety strategies in yacht harbours. By highlighting gaps in fire safety awareness and offering data-driven recommendations, this research can assist yacht harbour operators in developing more effective fire protection protocols. Moreover, the study aims to raise awareness among yachtsmen about the importance of fire safety preparedness, ultimately fostering a culture of safety that can enhance emergency responses and reduce the risk of fire-related incidents.

In conclusion, this research addresses the urgent need to improve fire safety measures in yacht harbours through increased awareness and compliance with regulatory standards. The findings are expected to provide actionable insights for both harbour management and regulatory bodies, ensuring safer environments for yachtsmen and all stakeholders involved in maritime operations. The recommendations derived from this study will not only improve fire safety in yacht harbours but also promote a proactive approach to managing fire risks within the broader maritime industry.

2. LITERATURE RELATED TO YACHT HARBOURS

The safety standards for yacht harbours are essential regulations and guidelines established to ensure the protection of lives and property for both yacht owners and visitors. These standards are defined at national and international levels through various legislations, standards, and regulations.

At the national level, maritime authorities of each country implement legal arrangements to establish safety standards in yacht harbour. These regulations generally cover aspects such as the construction, operation, and fire safety of yacht harbour. Additionally, they include provisions for emergency equipment, fire extinguishing systems, and emergency evacuation procedures that must be present in these facilities.

Globally recognized organizations such as ICOMIA (International Council of Marine Industry Associations), IMCI (International Marine Certification Institute), AMI (Association of Marina

Industries), and TYHA (The Yacht Harbour Association) play key roles in the certification, standardization, and accreditation of yacht harbours. The safety standards set by these organizations are widely known and respected, though not every marina adopts them commercially.

Research on fire prevention and safety has been a significant resource for reducing fire risks and enhancing safety standards in yacht harbours. The literature reviewed in this section serves as the foundation for further analysis and research in this thesis. When examining fire protection reference materials at both local and international levels, five key documents are considered in this study: the Maritime Tourism Regulations (published in 2009 and 2022), "Blue Flag Criteria and Guideline Notes for Marinas (2018)", TYHA's "Code of Practice for Marinas and Yacht Harbours", ISO 13687-3:2017 (Minimum Requirements for Yacht Harbours), and the NFPA 303 (Fire Protection Standard for Marinas and Boatyards) published by the U.S. National Fire Protection Association.

The establishment and implementation of safety standards in yacht harbours are of utmost importance for the organizations and personnel responsible for the operation of these facilities. Effective application of these standards not only ensures the safety of yacht owners and visitors but also helps maintain the reputation of the marina.

Portable fire pumps, equipped with diesel or gasoline engines, play a critical role in firefighting on floating docks by utilizing seawater to extinguish fires. Complementary systems like fire cabinets on piers contain essential tools, such as hoses, extinguishers, alarms, and first aid kits, while marinas integrate fuel stations with strict safety protocols and maintain action plans for emergencies (Balcı, 2011). Yacht safety is a top priority for marina management, encompassing fire prevention, theft deterrence, and protection against natural disasters, significantly influencing customer satisfaction, particularly in premium facilities (Sarı, 2011). However, Türkiye's yacht tourism faces challenges, including limited mooring capacity, bureaucratic hurdles, and the need for modernization and investment, all crucial for industry growth (Bayer, 2018).

Environmental concerns arise from yacht harbor waste, including oil, fuel, hazardous materials, and sewage, with spills posing severe risks (Dolgen et al., 2003). Modern marinas, offering diverse services like fuel, maintenance, fire response, and cultural activities, must balance expansion with environmental sustainability to meet evolving ecological expectations (Akaltan & Işık, 2019). Robust fire safety and security systems, such as hydrants, lighting, regular patrols, and specialized precautions for high-risk areas, are integral to operational standards (Oral, 2000; Tobiasson & Kollmeyer, 1991).

It is not expected that the spectators and passengers in the spectator sports facilities and passenger ships where the personnel who were applied to the research on fire training were trained about fire. Therefore, in the evacuation of the fire environment; in order to minimize the level of being affected by the negative effects such as panic, lack of light, smoke effect, lack of oxygen, reduced visibility, etc., it is necessary to comply with the instructions of the trained and assigned personnel. The personnel who provide this guidance gain competence with the training they receive on fire chemistry, escape routes, equipment to be used, and team coordination. (Çap, Biçer & Tavacıoğlu, 2022).

Awareness-raising approaches aim to improve the understanding of fire risks among yacht owners and yacht harbour staff and enhance their ability to respond appropriately. These approaches are usually implemented through training programs, seminars, brochures, posters, and other communication tools. In this way, yacht harbour users can recognize fire hazards, learn proper intervention methods, and act in accordance with emergency plans.

Yacht harbours are subject to the Maritime Tourism Regulation as part of local legislation and are classified as maritime tourism facilities. The regulation has undergone various changes over the years. The "Yacht Tourism Regulation" which was implemented in 1983 to "establish necessary regulations for the guidance and development of yacht tourism, yacht harbour operations, and yacht management, as well as to set the rules for operators, public officials, and yachtsmen to follow" was amended in 2009 and renamed the "Maritime Tourism Regulation." The regulation contains a provision regarding fire safety: "Measures ensuring the safety of vessels in terms of fire and theft, including entry and exit control of marine vehicles" (Maritime Tourism Regulation No. 27298, 2022).

Fire safety is a major concern within yacht harbours and the maritime sector. Implementing effective fire prevention measures is essential to avoid loss of life and property due to fires at yacht harbours. The literature highlights the need for safety and fire-related precautions, addressing the risks and problems associated with yacht harbours. Referring to international standards and regulations can provide numerous solutions to these issues.

The "Foundation for Environmental Education (FEE)" based in Copenhagen, Denmark, supports sustainable development in freshwater and marine areas through its "Blue Flag Program" aimed at yacht harbours. This program, launched in 1985, has gradually expanded globally, compelling local governments and tourism enterprises to adopt high standards in water quality, environmental education, environmental management, and safety. Over time, the Blue Flag has become an ecological label uniting various tourism sectors. Guidelines detailing how the criteria should be understood and managed are provided for yacht harbours, as specified in the "Blue Flag Criteria and Guidelines for Marinas" document, which includes both mandatory and guideline criteria. A marina that complies with the specified criteria can achieve Blue Flag accreditation. The Turkish Environmental Education Foundation (TÜRÇEV) is the authorized body responsible for managing the Blue Flag program in Türkiye. Once accredited, a marina is recognized as a "Blue Flag Marina." The "Blue Flag Criteria and Guidelines for Marinas" (2018) document contains four mandatory criteria related to fire safety under the "Safety Services" section:

- Criterion 30 specifies standards for lifeguards, first aid, and fire extinguishing equipment.

- Criterion 31 establishes emergency planning standards for pollution, fires, and other accidents.

- Criterion 32 outlines signage standards for safety precautions.

- Criterion 35 defines the standards for marina maps indicating facilities and their locations.

Examining global quality standards, the International Organization for Standardization (ISO) has developed the ISO 13687-3:2017 standard, "Yacht Harbors: Minimum Requirements" for marinas. The purpose of ISO 13687-3:2017 is to provide marina operators with a practical tool to promote health, safety, and environmental respect, aid the development of marinas and surrounding communities, and offer yachtsmen standardized information and services regardless of location. The ISO 13687-3:2017 standard includes several key points regarding fire safety and emergency preparedness, offering references for marina operators. In the safety requirements section, there are provisions for first aid kits, firefighting equipment, life-saving gear, and an emergency response plan for marinas. The signage requirements section covers the placement of firefighting equipment, fall risk signs, life-saving stations, electric shock risk signs, first aid kits, emergency ladders, and assembly points in marinas. The maintenance and cleaning requirements section emphasizes the necessity of a maintenance and cleaning program to ensure facilities remain safe for human use and prevent the spread of diseases, which includes maintaining safety equipment, emergency systems, and the proper disposal of hazardous materials (ISO 13687-3:2017, p.7). The security section outlines the requirement for marinas to have either 24/7 professional security personnel or a closed-circuit monitoring system with recording capabilities for at least seven days (ISO 13687-3:2017, p.7).

The National Fire Protection Association (NFPA), a global organization based in the U.S. since 1896, focuses on eliminating death, injury, and property loss caused by fire and electrical hazards. The NFPA develops over 300 published codes and standards related to fire, electrical, and building safety, and has more than 70,000 members worldwide involved in its code development process. Through research, education, and outreach, the NFPA helps save lives and reduce losses.

The NFPA 303: Fire Protection Standard for Marinas and Boatyards applies specifically to marinas and related facilities, including boatyards, yacht clubs, and docking facilities, by providing requirements for fire and electrical safety. NFPA 303:5 details the requirements for electrical installations and equipment in marinas, while NFPA 303:7 covers regulations related to the dry storage of boats (dry docks), including requirements for inspecting hazardous materials, disconnecting batteries, and implementing additional fire protection measures like automatic sprinkler systems. Before dry docking, the marina management is required to inspect vessels for the presence of hazardous materials such as gas cylinders

and fuel tanks. NFPA 303 also provides guidelines for marina operations, emphasizing the importance of regularly inspecting, testing, and maintaining firefighting equipment and fire protection systems in compliance with the manufacturer's instructions and applicable NFPA standards. For instance, fire extinguishers should be inspected, tested, and maintained according to NFPA 10 standards, while sprinkler and fire hydrant systems should be maintained in accordance with NFPA 25. Furthermore, all staff members should be trained in firefighting procedures, the use of portable fire extinguishers, and the roles they are expected to perform during an emergency.

The findings of the study suggest that while the majority of yacht harbours meet basic fire safety requirements, there are still areas in need of improvement. The data indicates a need for strategies to raise awareness of fire safety in marinas. In this regard, it is recommended that marinas increase education and awareness activities, ensure regular maintenance of firefighting equipment, and keep emergency plans up to date. Compliance with internationally recognized standards and practices in fire safety at yacht harbours is of great importance. Marina management is advised to reference ISO 13687-3:2017 and NFPA 303 documents to ensure adherence to fire safety regulations, which cover a broad spectrum of fire prevention measures, fire detection systems, and emergency response plans.

3. MATERIALS AND METHOD

3.1. Purpose and Importance

The aim of this study is to enhance awareness of fire safety in yacht harbours and to evaluate the current fire safety practices. Fire safety is of critical importance for both life and property protection for yacht owners and yacht harbour operators. Effective interventions and measures in the event of a fire play a vital role in preventing loss of life and minimizing financial damage. This research seeks to raise awareness, improve knowledge levels, and develop fire safety practices in yacht harbours.

3.2. Population and Sample

The target population of this study consists of yacht owners with boats in various yacht harbours across Türkiye. A total of 145 participants were selected from yacht harbours of different sizes. The participants were diversified based on their demographic characteristics and levels of knowledge about fire safety. This diversity aims to enhance the generalizability of the study's findings.

Care was taken to ensure the confidentiality and security of participants' data. The survey forms indicated that yachtmen' personal information would be protected and that the data would be used solely for research purposes.

3.3. Hypotheses of Research

The primary hypothesis of this study is that fire safety awareness scale in yacht harbours is significantly affected by demographic and experiential factors. To explore these relationships sub-hypotheses were developed, examining variables such as roles of the yachtmen (H1), firefighting training (H2), firefighting equipment (H3), fire on a boat (H4) and fire in the yacht harbour (H5).

Table 1: Hypotheses of Research

	Hypotheses
H_1	Awareness of fire protection in yacht harbours significantly differs based on roles within the yacht harbour.
H_2	Awareness of fire protection in yacht harbours significantly differs based on whether yachtmen have firefighting training.
H_3	Awareness of fire protection in yacht harbours significantly differs based on knowledge of how to use firefighting equipment.
H_4	Awareness of fire protection in yacht harbours significantly differs based on knowledge of what to do in case of a fire on a boat.
H_5	Awareness of fire protection in yacht harbours significantly differs based on knowledge of what to do in case of a fire in the yacht harbour.

3.4. Assumptions and Constraints

All yachtmen participating in the survey responded to the questions based on their genuine feelings and thoughts. It is presumed that each yachtman willingly answered the survey and responded to all the questions accurately and completely. It is also assumed that each survey yachtman understood the true meaning of the questions presented in the survey.

3.5. Data Collection Tool

The study adopts a "non-experimental quantitative research" design. In terms of implementation style, it is classified as a survey method. During the data collection phase from the sample, the "field survey" method was chosen. In this model, a questionnaire was used as a data collection tool to obtain yachtmen' thoughts in written form.

The questionnaire consists of 36 questions, divided into two main sections and five subdimensions. The first section investigates demographic and general characteristics such as gender, age and education background. The second section includes various questions related to familiarity with firefighting equipment and knowledge level regarding fire emergencies in the yacht harbour. The subdimensions of fire safety knowledge and awareness, training and drills, firefighting equipment, emergency plans, cooperation, and fire safety development were created.

The Fire Protection Awareness Scale in Yacht Harbours, with a Cronbach's Alpha reliability coefficient of 0.856, is a 5 point Likert scale. The scale's rating is as follows: 1-Strongly Disagree, 2-Disagree, 3-Neutral, 4-Agree, 5-Strongly Agree. There are no reverse-scored items in the scale.

4. RESULTS AND DISCUSSION

4.1. Reliability of the Survey

The tests used to assess the reliability of the questionnaire include "Cronbach Alpha (CA), Split-half, Parallel, and Strict Parallel" methods. Reliability and internal consistency are considered achieved when the results from all the criteria exceed 70%. As shown in Table 2, the results from all four criteria exceeded the 70% threshold, confirming the reliability of the scale. Thus, it was determined that the analysis outcomes are reliable.

Given that group difference analysis would be conducted, power analysis results for this method were presented, determining the minimum sample size. The power analysis was conducted using G*POWER 3.1 software. Cohen (1988) and Prajapati et al. (2010) noted that a statistical power of $1-\beta = 0.80$ is sufficient, and group differences were calculated accordingly. The statistical significance level was accepted as $\alpha = 0.05$. The power analysis determined that a minimum of 102 samples would be necessary to ensure the validity of the study in group difference analyses. Consequently, it was confirmed that a sample size of 145 is statistically suitable for drawing inferences.

Table 2: Results of Reliability Analysis of The Survey

Criteria	Reliability Results of the Survey
Cronbach Alpha	0,856
Split	0,850-0,858
Parallel	0,855
Strict	0,856

4.2. Demographic and General Information Percentage Distribution

Participants, 26.2% are female, and 73.8% are male. Regarding educational background, 12.4% have completed high school, 0.7% have an associate degree, 52.4% have a bachelor's degree, 27.6% have a master's degree, and 6.9% hold a doctoral degree. In terms of age, 2.1% of participants are in the 18-24 age range, 22.8% are in the 25-34 age range, 43.4% are in the 35-44 age range, 18.6% are in the 45-54 age range, 10.3% are in the 55-64 age range, and 2.8% are 65 years or older. As for geographical location, 0.7% of participants live in Antalya, 2.8% in Aydın, 0.7% in Çanakkale, 49.0% in the Anatolian

side of Istanbul, 21.4% in the European side of Istanbul, 9.0% in Izmir, 1.4% in Mersin, and 15.2% in Muğla. Regarding roles at the yacht harbour, 67.6% are yacht owners, 13.8% are yacht harbour staff, 13.1% are sailing instructors, and 5.5% are sailing school employees. In terms of boat ownership duration, 6.2% have owned a boat for 0-1 year, 34.5% for 2-4 years, 25.5% for 5-9 years, and 33.8% for 10 years or more. Finally, 49.7% of participants have had fire safety training, while 50.3% have not.

4.3. Percentage Distribution Information for Scales

The percentage distributions of the responses and the average scores for the scales used are presented in this section of the study.

As shown in Table 3, in the Fire Protection Awareness Scale in Yacht Harbours, yachtmen gave the highest average score of 4.61 to the statement "I believe that fire drills are useful in preparing for actual fire situations." with the response "Strongly Agree." The lowest average score of 1.86 was given to the statement "I think the yacht harbour staff has sufficiently informed me about fire safety" with the response "Disagree."

Overall, yachtmen' responses to the Fire Protection Awareness Scale in Yacht Harbours yielded a general average of 3.45, reflecting a response of "Neutral."

Table 3: Percentage Distribution Of The Attitude Scale Of Yacht Harbours Fire Protection Practices And Review Of Awareness Level

Items		Strongly Disagree	Disagree	Neutral	Agree	Strongly Agree	Avg. ± S_d.
1	I have sufficient knowledge about fire safety.	11,7	17,9	24,8	34,5	11,0	3,15 ± 1,19
2	I am familiar with firefighting equipment.	6,9	7,6	32,4	32,4	20,7	3,52 ± 1,11
3	I make an effort to keep my knowledge of fire safety up to date.	17,2	13,8	29,0	24,8	15,2	3,07 ± 1,30
4	I believe that fire safety awareness enhances the overall safety of the yacht harbour.	4,1	5,5	9,0	20,0	61,4	4,29 ± 1,11
5	Fire safety training/drills are conducted regularly at the yacht harbour.	33,8	17,9	33,1	5,5	9,7	2,39 ± 1,27
6	Fire drills help me improve my fire response skills.	1,4	1,4	8,3	20,0	69,0	4,54 ± 0,82
7	I think fire safety training should be more comprehensive.	0,7	0,7	10,3	20,0	68,3	4,54 ± 0,76
8	I believe fire drills are beneficial for preparedness in real fire situations.	0,7	2,1	5,5	18,6	73,1	4,61 ± 0,75
9	I feel that yacht harbour staff adequately inform me about fire safety.	51,0	22,1	20,7	2,1	4,1	1,86 ± 1,08
10	Firefighting equipment is appropriately placed and easily accessible.	6,2	12,4	35,9	31,0	14,5	3,35 ± 1,07
11	The modernization of firefighting equipment is sufficient.	7,6	14,5	47,6	20,7	9,7	3,10 ± 1,02
12	Fire equipment in the yacht harbour is maintained regularly.	6,9	9,0	59,3	15,9	9,0	3,11 ± 0,94
13	I regularly maintain and inspect the firefighting equipment on my boat.	4,8	4,8	14,5	26,9	49,0	4,10 ± 1,12
14	I have adequate knowledge about how to act during emergencies.	7,6	9,0	23,4	31,7	28,3	3,64 ± 1,20
15	The emergency action plan at the yacht harbour is up-to-date.	11,7	9,7	59,3	11,7	7,6	2,94 ± 0,99
16	The emergency action plan is clearly and comprehensively outlined.	13,1	14,5	52,4	13,8	6,2	2,86 ± 1,02

17	I know how to respond when I hear fire alarms or warnings.	14,5	13,1	29,0	27,6	15,9	3,17 ± 1,27
18	I feel confident in my ability to intervene if I see a fire at the yacht harbour.	13,8	13,8	28,3	24,1	20,0	3,23 ± 1,30
19	The yacht harbour should gather feedback from boat owners to improve fire safety practices.	1,4	4,1	18,6	29,0	46,9	4,16 ± 0,96
20	I share my knowledge and experiences about fire safety with other boat owners.	5,5	9,0	25,5	29,0	31,0	3,71 ± 1,16
21	I believe the yacht harbour where my boat is docked is sufficient in terms of fire safety.	8,3	12,4	53,8	17,2	8,3	3,05 ± 0,98
	General Response Average of the Fire Safety Awareness Scale in Yacht Harbours	**3,45**					

4.4. Normality Tests and Descriptive Statistical Data

To assess the appropriateness of further parametric analyses, normality tests were conducted across various dimensions. The results of the normality tests are pivotal in determining the appropriate analytical methods to be employed. Accordingly, Table 4 provides descriptive statistics along with the normality test outcomes for all dimensions. As shown in Table 4, the null hypothesis (H0), which asserts that the data follows a normal distribution, is accepted since the results of both normality tests indicate $p > 0.05$. Consequently, parametric methods will be utilized for group difference analyses.

Table 4: Descriptive statistical information and normality test results for dimensions.

Dimensions	Average	St. Deviation	Asymmetry	Kurtosis	Kolmogorov-Smirnov		Shapiro-Wilk	
					ist	p	ist	p
Score of the Fire Safety Awareness Scale in Yacht Harbours	3,45	0,58	0,16	-0,03	7,060	0,267	8,991	0,441

4.5. Group Difference Analyses

In the statistical evaluation of group differences, an independent samples t-test was applied for comparisons between two groups, and a one-way ANOVA test was used for comparisons involving more than two groups.

The choice of methods for the analyses depends on whether the distribution of the data is normal, so the Kolmogorov-Smirnov and Shapiro-Wilk normality tests were applied to the scale dimensions. Since the distribution followed a normal distribution, parametric methods were used in the group difference analyses.

Upon examining Table 5, a significant difference was found in the overall scale dimension with respect to the role in the yacht harbour ($p<0.05$). Yachtmen with the role in the yacht harbour had significantly higher scores in the overall scale dimension (3.76±0.51).

Table 5: ANOVA Test Results by Role in the Yacht Harbour.

	Group	n	$\bar{X}$	Sd.	F-ist	p	Post-hoc (Tukey)
Score of the Fire Safety Awareness Scale in Yacht Harbours	(1)Yacht Owner	98	3,44	0,57	3,270	0,023*	2>1, 2>3, 2>4
	(2)Yachtmen	20	3,76	0,51			
	(3)Sailing Instructor	19	3,25	0,65			
	(4)Sailing School Employee	8	3,20	0,43			

*Significant difference for $p<0.05$

Upon examining Table 6, a significant difference was found in the overall scale dimension with respect to having firefighting training ($p<0.05$). Yachtmen who had fire safety training "Yes" had significantly higher scores in the overall scale dimension (3.78±0.51).

Table 6: t-Test Results for Having Firefighting Training.

	Group	n	$\bar{X}$	Sd.	t-ist	p
Score of the Fire Safety Awareness Scale in Yacht Harbours	Yes	72	3,78	0,51	8,121	0,000*
	No	73	3,13	0,46		

*Significant difference for $p<0.05$

Upon examining Table 7, a significant difference was found in the overall scale dimension with respect to knowing how to use fire extinguishing equipment ($p<0.05$). Yachtmen who knew how to use firefighting equipment "Yes" had significantly higher scores in the overall scale dimension (3.52±0.55).

Table 7: t-Test Results for Knowledge of Using Firefighting Equipment.

	Group	n	$\bar{X}$	Sd.	t-ist	p
Score of the Fire Safety Awareness Scale in Yacht Harbours	Yes	132	3,52	0,55	8,788	0,000*
	No	13	2,72	0,28		

*Significant difference for $p<0.05$

Upon examining Table 8, a significant difference was found in the overall scale dimension with respect to knowing what to do in the event of a fire on the boat ($p<0.05$). Yachtmen who knew what to do in the event of a fire on the boat "Yes" had significantly higher scores in the overall scale dimension (3.57±0.53).

Table 8: t-Test Results for Knowledge of What to Do in the Event of a Fire on the Boat.

	Group	n	$\bar{X}$	Sd.	t-ist	p
Score of the Fire Safety Awareness Scale in Yacht Harbours	Yes	121	3,57	0,53	6,613	0,000*
	No	24	2,82	0,37		

*Significant difference for $p<0.05$

Upon examining Table 9, a significant difference was found in the overall scale dimension with respect to knowing what to do in the event of a fire at the yacht harbour ($p<0.05$). Yachtmen who knew what to do in the event of a fire at the yacht harbour "Yes" had significantly higher scores in the overall scale dimension (3.85±0.49).

Table 9: t-Test Results for Knowledge of What to Do in the Event of a Fire at the Yacht Harbour.

	Group	n	$\bar{X}$	Sd.	t-ist	p
Score of the Fire Safety Awareness Scale in Yacht Harbours	Yes	57	3,85	0,49	7,988	0,000*
	No	88	3,19	0,48		

*Significant difference for $p<0.05$

The responses to questions aimed at measuring yachtmen' knowledge of fire safety indicate that when the questions relate to the individual or their vessel, the level of knowledge is high. However, when the questions are about the yacht harbour where their boats are docked, the responses are either neutral or indicate a low level of knowledge. Forty-five percent of yachtmen consider their knowledge of fire safety to be adequate. Fifty-three percent claim to be knowledgeable about the use of fire extinguishing devices, while 15% state that they lack sufficient knowledge on the subject, and 32% express uncertainty about their knowledge. Additionally, 76% of yachtmen regularly maintain and check the fire extinguishing equipment on their boats, and 60% are confident in their knowledge of how to act in an emergency situation.

5. CONCLUSION AND RECOMMENDATIONS

The preliminary study conducted on measuring fire protection practices and awareness levels in yacht marinas revealed significant gaps in fire safety awareness. The findings offer various recommendations for improving existing fire safety practices and enhancing fire prevention awareness. These recommendations include strengthening training programs, review of emergency action plans, improvement of firefighting equipment, strengthening communication and collaboration, full compliance with legal regulations.

The implementation of these recommendations could lead to significant improvements in fire protection and safety at yacht harbours and, in general, enhance safety within the maritime sector. Moreover, fostering better communication and collaboration between stakeholders will contribute to a more comprehensive approach to fire safety. These steps will not only protect lives and assets but also contribute to the overall development of safer maritime practices.

Current fire safety practices are often not fully aligned with national and international regulations. Issues such as the lack of fire extinguishing equipment, insufficient emergency evacuation procedures, and inadequate personnel training create significant safety risks. There is no standardized approach for defining and implementing emergency procedures in yacht harbours. The research indicate that there is a need to develop emergency action plans to improve fire protection practices and awareness levels in yacht harbours. These plans should address the organization of fire safety training, improvement of fire extinguishing equipment, standardization of emergency evacuation procedures, and full compliance with relevant legal regulations.

The findings of the study indicate that fire safety practices at yacht harbours are generally insufficient. Notably, it was found that the lack of effective communication regarding the maintenance and checks of fire extinguishing equipment compromises its adequacy, potentially impairing the functionality of the equipment in case of an emergency. Furthermore, it was observed that fire drills were not conducted regularly, and yacht owners were not adequately trained in fire response.

The results of the study offer several recommendations for improving fire safety practices. First, it is essential to mandate regular maintenance and checks of firefighting equipment. Additionally, fire drills and training should be organized regularly and comprehensively, encompassing both theoretical knowledge and practical applications.

The importance of continuous and comprehensive training programs to raise awareness about fire safety should be emphasized. These programs should not only provide information on reducing fire risks but also enhance the ability to respond quickly and effectively in emergencies. The training should focus on both theoretical knowledge and practical training, including the use of fire extinguishing equipment and the implementation of emergency procedures.

Integrating technological innovations is also a critical factor in enhancing fire safety levels at yacht harbours. New-generation fire extinguishing systems, smart fire alarm systems, and other technological solutions can effectively minimize fire risks. Such innovations should be adopted and implemented by yacht harbour management.

Improving fire protection practices and awareness levels in yacht harbours is a crucial step toward ensuring safety in the maritime sector and protecting human lives and property. To achieve this, collaboration and coordination among harbour managers, employees, and yacht owners must be enhanced.

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