World Journal of Advanced Research and Reviews
eISSN: 2581-9615 CODEN (USA): WJARAI
Cross Ref DOI: 10.30574/wjarr
Journal homepage: https://wjarr.com/

(RESEARCH ARTICLE)

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Determining the capacity of dog search and rescue teams

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World Journal of Advanced Research and Reviews, 2025, 26(01), 2644-2652

Publication history: Received on 07 March 2025; revised on 17 April 2025; accepted on 19 April 2025

Article DOI: https://doi.org/10.30574/wjarr.2025.26.1.1364

Abstract

In addition to disasters and emergencies such as earthquakes, cases of missing persons are increasingly encountered in daily life in our country. To ensure rapid and effective response to disasters across the country, various search and rescue methods have been developed. One of these methods is the use of dog search and rescue teams. Dog search and rescue teams are highly effective and efficient tools for detecting individuals under rubble, locating missing persons, and conducting search and rescue operations in disaster-affected areas. These teams play a critical role in post-disaster search and rescue processes. Especially in major disasters such as earthquakes, avalanches, and landslides, dogs are highly successful in locating people trapped under debris. These teams are stationed in the provinces of Istanbul, Ankara, Izmir, Bursa, Samsun, Erzurum, Adana, Van, Diyarbakır, Afyonkarahisar, and Sakarya. The teams consist of search and rescue personnel, primarily including veterinarians. This study aims to determine the capacities of dog search and rescue teams through a survey. An online questionnaire was administered to 19 search and rescue personnel working in dog search and rescue teams. The study analyzed the operational capacities of the teams, trainer profiles, dog competency levels, regional distributions, and task effectiveness. The findings indicate that the current capacity is occasionally insufficient, and there is a need to improve access and response times, especially in rural areas. This study aims to contribute to improving search and rescue performance during disasters by providing recommendations for capacity enhancement.

Keywords: Dog-assisted search teams; Search and rescue; Disaster management; Specialist search dog; Questionnaire survey,

1. Introduction

A disaster is defined as an event that results in serious physical destruction along with the injury and death of a large number of people, such as earthquakes, tsunamis, floods, landslides, volcanic eruptions, hurricanes, tornadoes, plane crashes, train accidents, nuclear power plant accidents, explosions, and terrorist attacks [1]. Disasters are natural, human-made, or technological events that affect all or part of a society, disrupt daily functioning by interrupting or making human activities impossible, cause loss of life and property, and damage the flora and fauna [2].

Search and Rescue (SAR) is an activity aimed at rescuing victims at risk as a result of natural disasters or accidents using various vehicles and specialized equipment. SAR teams must be the first to reach the scene and apply different rescue methods. However, these operations often take place under challenging conditions that involve high risks for both the victims and the rescue teams [3]. SAR is a critical component of post-disaster recovery efforts. Every second saved during the search increases the chances of finding survivors, and most of these teams prefer using dogs [4]. SAR dog work represents a remarkable collaboration between humans and dogs, where both species contribute distinct skills towards a shared goal [5].

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The use of dogs for SAR was first recorded in the 1800s, but anecdotal evidence suggests it may date back 200 years earlier. Heroic dogs in World War I and II represent early examples of organized SAR efforts. Military dogs, known as ambulance and Red Cross dogs, were used on the battlefield to locate the wounded and deliver first aid supplies. This practice ensured that dogs continued to play a vital role in search and rescue missions during wars and disasters. Modern dogs are trained in new skills, such as locating illicit drugs, bombs, cadavers, and arson evidence, while also assisting in avalanche rescue, disaster recovery, missing person discovery, and tracking [6, 7].

Although most SAR dogs belong to working, herding, hunting, or sporting breeds, mixed breeds can also be successful. Important characteristics in a potential SAR dog include hunt drive, prey drive, and ball drive. Dogs with high drive will search for extended periods without giving up or seeking help from their handler. Additionally, dogs that are well-tempered, use scent to identify prey, are trainable, inquisitive, and friendly tend to be successful in SAR work [8].

1.1. Aims and Objectives of the Study

In addition to disasters and emergencies such as earthquakes, cases of missing persons are increasingly observed in daily life in our country. In order to ensure rapid and effective response to disasters across the country, various search and rescue methods have been developed. One of these methods is the use of dog search and rescue teams. Dog search and rescue teams are highly effective and efficient tools for detecting individuals trapped under debris, locating missing persons, and conducting search and rescue operations in disaster-affected areas. Especially in major disasters such as earthquakes, avalanches, and landslides, dogs are highly successful in locating people trapped under the rubble. These teams are deployed in the provinces of Istanbul, Ankara, Izmir, Bursa, Samsun, Erzurum, Adana, Van, Diyarbakır, Afyonkarahisar, and Sakarya. Search and rescue personnel, including in most cases veterinarians, are assigned to the dog search and rescue teams. This study aims to determine the capacities of dog search and rescue teams through a survey.

2. Literature Review

In missing person search operations, alongside technological tools, dogs are also utilized. Search dogs offer significant advantages in locating individuals who have gone missing for various reasons, such as those hiding due to psychological disorders, victims of domestic violence, or elderly individuals suffering from Alzheimer's disease [9, 10, 6, 8].

In missing person cases, various technological devices (such as drones, thermal cameras, etc.) are used as technical equipment. Drones scan the area by transmitting live images to the command center through an onboard camera. They offer advantages such as the ability to view the search area from a wide perspective and the capability to scan a large area quickly in open terrain (where vegetation is not dense), provided that the conditions are favorable [10, 11, 12].

Thermal binoculars are devices that function based on detecting heat in the environment. As an imaging method, thermal binoculars enable night vision and can convert heat energy into images. Invisible infrared (IR) energy becomes visible as colors or even shapes thanks to thermal imaging [11].

Through rigorous training and the aid of their highly developed senses, professional search and rescue (SAR) dogs—who are members of urban search and rescue teams—are extremely helpful in locating buried or missing persons during disasters. Although dogs are one of the first helpers that come to mind when it comes to search and rescue, they assist humans in many areas of life. Dogs that undergo training in fields such as hunting, forensic cases, search and rescue, and special education can help in the early diagnosis of patients with lung, colorectal, and bladder cancer by sniffing their breath and sweat. Nowadays, they can even detect low blood sugar levels, pregnancy, and coronavirus [13, 14, 15].

All search techniques used in missing person cases rely on visual detection (direct or indirect). Dogs, however, rely on their sense of smell. Unlike technological search devices, dogs do not search with their eyes. For them, the presence of a scent is sufficient. During their training, the ability to effectively utilize their strong sense of smell is essential. Due to the various disadvantages of technological devices, dog-assisted search becomes more advantageous compared to all other search methods [6, 8, 9].

3. Material and methods

Before the intervention of dog search teams, individual rescue efforts carried out by local residents using their own means in missing person cases are often primitive and insufficient. Recently, the AFAD organization has reached a significantly adequate level in terms of both training personnel and search dogs, as well as the availability of necessary

equipment and tools. In this study a survey was conducted with personnel involved in search and rescue operations within AFAD units using dog search teams. The survey was administered online. Compared to traditional data collection methods such as face-to-face surveys, online surveys offer several advantages, including reduced data collection time, lower costs, the elimination of distance-related challenges—which are particularly significant in field research—and no need for manual data entry. For these reasons, an online survey was chosen for this study. An online survey was applied to 19 personnel involved in search and rescue activities with dog-assisted search teams in AFAD organizations. Multiple-choice and short-answer written questions were used in the questionnaire to collect data. Some questions were given the opportunity to give more than one answer. Survey questions were prepared by the researchers since it is a preliminary study. In the first part of the data collection tool, questions introducing the participants to the research are included. In the second part, questions about animal rescue and animal keeping and hosting are included.

In this study, the operational capacities of AFAD dog-assisted search teams, trainer profiles, dog competency levels, regional distributions, and task effectiveness were analyzed. All procedures performed in the study were app-roved by the ethical committee (Letter of Health Sciences Scientific Research and Publication Ethics Committee dated 24.05.2018 and numbered 49533702).

SPSS 25.0 was used in the analysis of the data. Descriptive statistics (f, Mean, SD) were given first.

4. Results and discussion

The findings obtained because of the analyses conducted in accordance with the objectives of the research are presented in this section. The findings are provided in the form of tables and figures, and explanations regarding these tables and figures are given below each of them.

Table 1 Frequency and Percentage Values for the Gender Variable

Gender	Frequency (f)	Percentage (%)
Male	19	100
Total	19	100

The gender variable shows no diversity, as all participants are male. This suggests a lack of gender representation, possibly due to the male-dominated nature of the profession, sampling bias, or cultural factors affecting participation.

Table 2 Age Distribution of Participants

Age Range	f	%
30–39	9	47.4
40–49	10	52.6
Total	19	100

The age distribution indicates a balanced representation between the 30–39 and 40–49 age groups, suggesting a mature, professionally experienced, and physically capable workforce, well-suited for demanding tasks like dog search and rescue.

Table 3 Educational Background of Participants

Education Level	f	%
High School	2	10.5
Associate Degree	4	21.1
Bachelor's Degree	11	57.9
Postgraduate Degree	2	10.5
Total	19	100

Most participants are well-educated, with the majority holding a bachelor's degree. This reflects a group likely equipped with the technical knowledge and decision-making skills essential for search and rescue operations.

Table 4 Provincial Distribution of Participants

Province	**f**	**%**
Afyonkarahisar	5	26.4
Istanbul	4	21.1
Samsun	4	21.1
Bursa	3	15.8
Ankara	2	10.5
Sakarya	1	5.3
Total	19	100

The participant distribution shows key concentrations in Afyonkarahisar, Istanbul, and Samsun, indicating major operational hubs. Despite lower representation from some provinces, the overall geographic spread supports strong national emergency response coverage.

Table 5 Participants' Affiliated Units

Unit	**f**	**%**
AFAD (Dog Search)	18	94.7
K9	1	5.3
Total	19	100

The data highlights AFAD's dominant role in dog search operations, with nearly all participants (94.7%) affiliated with its units. This underscores AFAD as the main institutional force in Türkiye's dog-assisted search and rescue efforts.

Table 6 Participants' Roles

Role	**f**	**%**
Search and Rescue Technician	17	89.5
Veterinarian	2	10.5
Total	19	100

Most participants (89.5%) are Search and Rescue Technicians, showing that dog search operations are mainly field-driven. A smaller portion (10.5%) are Veterinarians, highlighting the importance of medical support for the dogs. This points to a collaborative, interdisciplinary team structure.

Table 7 Participants' Professional Experience

Years of Experience	**f**	**%**
1–5 years	2	10.5
6–10 years	9	47.4
11–20 years	7	36.8
21 years and above	1	5.3
Total	19	100

Nearly half of the participants (47.4%) have 6-10 years of experience, indicating moderate tenure and field expertise. A significant portion (36.8%) has 11-20 years of experience, reflecting high professional maturity. This shows a well-experienced team with most individuals having over 5 years of practical experience in search and rescue.

Table 8 Participants' Involvement in Search and Rescue Missions

Number of Missions	f	%
11–15	2	10.5
16–24	4	21.1
25 and above	13	68.4
Total	19	100

The majority of participants (68.4%) have participated in 25 or more search and rescue missions, showcasing extensive experience. A smaller group (21.1%) has been involved in 16–24 missions, and only 10.5% in 11–15 missions. This indicates that most respondents are highly experienced, reinforcing the capability and reliability of the dog search teams surveyed.

Table 9 Participants' Dog Search Training Status

Training Status	f	%
Received Dog Search Training	14	73.7
Did Not Receive Dog Search Training	5	26.3
Total	19	100

The majority of participants (73.7%) have received dog search training, indicating strong preparedness in this area. However, 26.3% have not undergone formal training, highlighting a potential need for additional training resources. Overall, the data reflects a well-trained workforce with room for further development to ensure comprehensive training for all participants.

Table 10 Distribution of Institutions Where Dog Search Training Was Received

Institution	f	%
AFAD	6	33.4
Redog	5	27.8
Security general directorate	3	16.7
Turkish armed forces	2	11.1
FEMA	1	5.5
Fire department	1	5.5
Total*	18	100

* Some participants have received training from multiple institutions.

AFAD is the leading institution where most participants received their dog search training, with 33.4% reporting training there. Redog follows with 27.8%, while other institutions like Security general directorate, Turkish armed forces and FEMA contribute smaller shares. Some participants have attended multiple institutions, indicating a diverse training background in dog search operations.

Table 11 Number of Search and Rescue Dogs in Units

Number of Dogs	f	%
1	5	26.3
2	2	10.5
3	2	10.5
4	1	5.3
5	3	15.8
6	1	5.3
7	5	26.3
Total	19	100

The most common number of search and rescue dogs per unit is 1 and 7 dogs, each accounting for 26.3% of the total. Units with 5 dogs make up 15.8%, while fewer units have 2, 3, or 4 dogs, suggesting some teams may be smaller or less equipped. Overall, most units have between 1 and 7 dogs, indicating varied team sizes, with a preference for smaller teams.

Table 12 Distribution of Dog Specializations

Specialization	f	%
Debris and Collapse Search	18	46.1
Tracking	9	23.1
Land Search	9	23.1
Cadaver Dog	3	7.7
Total*	39	100

* Some dogs have more than one specialization, which is why the total number (39) exceeds the total number of units (19).

The most common specialization is Debris and Collapse Search, with 46.1% of dogs trained in this area. Tracking and Land Search dogs each account for 23.1%, while Cadaver dogs make up 7.7% of the total.

Table 13 Search and Rescue Case Distributions

	1st Rank		2nd Rank		3rd Rank	
	f	%	f	%	f	%
Missing in the Field	19	100	-	-	-	-
Debris Collapse	-	-	15	78.9	1	5.3
Person Lost in Flood	-	-	2	10.5	10	52.6
Water Search	-	-	2	10.5	-	-
Total	19	100	19	100	11*	55.9*

*44% of participants did not specify a third case, resulting in a lower total count for the third rank.

The most common search and rescue scenario is Missing in the Field, reported by all participants (100%). The second most common is Debris Collapse, mentioned by 78.9%, with Person Lost in Flood also notable at 10.5%. For the third rank, 44% of participants did not specify a case, but among those who did, Person Lost in Flood was the most common (52.6%), followed by Debris Collapse at 5.3%.

Table 14 Distribution of Search and Rescue Dog Equipment

Equipment	f	%
Agility Course	18	94.7
Search Debris	13	68.4
Guidance Course	8	42.1
Transport Vehicle	5	26.3
Barking Boxes	3	15.8
Conditioning Course	1	5.3

The most common search and rescue equipment is the Agility Course (94.7%), followed by Search Debris (68.4%), highlighting their importance in training and operations. The Guidance Course (42.1%) is also notable for navigation and control during searches. Less common equipment includes Transport Vehicles (26.3%), Barking Boxes (15.8%), and Conditioning Courses (5.3%). This distribution emphasizes the critical role of agility and debris search equipment in dog search and rescue operations.

Table 15 People and Institutions Collaborated with in Dog Search and Rescue Operations

Collaborated Parties	f	%
Volunteer Organizations	19	100
Military Search and Rescue Units	16	84.2
Fire Department	13	68.4
Relatives of the Missing	13	68.4
Eyewitnesses	9	47.4

All participants (100%) collaborate with volunteer organizations, highlighting the crucial role of civil society in search operations. The military (84.2%) and fire department (68.4%) are key partners, reflecting the multidisciplinary nature of missions. Coordination with relatives of the missing (68.4%) and eyewitnesses (47.4%) provides valuable emotional and situational insights, helping to refine search areas.

Table 16 Distribution of Challenges Encountered in Search and Rescue Operations

Challenge	1st Rank		2nd Rank		3rd Rank	
	f	%	f	%	f	%
Lack of Interagency Coordination	13	68.4	4	21.1	2	10.5
Physical Factors	4	21.1	5	26.3	1	5.3
Equipment Shortages	2	10.5	2	10.5	3	15.8
Lack of Experience	-	-	3	15.8	3	15.8
Total	19	100	*	*	*	*

* Not all participants marked the second and third options.

Lack of interagency coordination is identified as the most significant issue by 68.4% of participants, emphasizing the need for better collaboration between institutions in search and rescue operations. Physical conditions, such as terrain and weather, are also major concerns, often ranked second. Equipment shortages and lack of experience, though less frequently ranked first, remain important issues. Some participants not ranking all three challenges may indicate a focus on their top priorities or limited experience with certain difficulties.

The most significant challenge identified by participants is **interagency coordination issues** (68.4% ranked it as the top issue), highlighting the need for better collaboration between institutions. **Physical factors** (e.g., harsh terrain,

weather) were more often mentioned as second-level challenges. **Lack of equipment** and **insufficient experience** are consistent concerns but are not as frequently marked as primary issues.

All participants stated that there is no legal basis defining the status of dog trainers, and they reported facing numerous issues in this regard. As solutions, they suggested the following:

- Establishing positions for dog training specialists (f = 10)
- Creating regulations and a legal framework (f = 5)
- Addressing the lack of certification (f = 3)
- Improving job descriptions (f = 2)
- Organizing and enhancing working conditions (f = 2)
- Providing additional incentives and motivation resources for trainers (f = 1)

5. Conclusion

Search and rescue teams with dogs play a critical role in post-disaster rescue operations. Especially in major disasters such as earthquakes, avalanches, and landslides, dogs are extremely successful in locating people trapped under rubble. Their strong sense of smell provides a natural advantage. As a result, faster and more effective outcomes can be achieved while searching for survivors under the debris. Dogs that are highly motivated for rescue, physically agile, and socially inclined in character undergo a training process of approximately three to three and a half years before being subjected to an examination. Dogs that pass the exam earn the right to be deployed during disasters. When examining the dog search and rescue efforts during the 1999 Gölcük earthquake, it was observed that the majority of assistance came from foreign countries. The 1999 Gölcük earthquake marked a turning point, raising awareness about the lack of search and rescue dogs. This led to changes in international search and rescue regulations, the implementation of these changes in Turkey in subsequent years, and increased investment in the training of search and rescue dogs within the country [16]. In our study, it was determined that all the dogs were part of rubble search teams.

The duties of AFAD search and rescue teams with dogs are not limited to finding survivors under rubble. They also have important tasks such as tracking missing individuals, conducting searches in emergency areas, and carrying out the first response in identified risky zones.

Dogs are effectively used in both live and cadaver searches as support to human efforts. Thanks to their keen sense of smell, they can locate individuals in confined spaces, operate without causing secondary collapses, and deliver essential supplies like food and water to disaster victims. However, their success rate is not always 100%. In Türkiye, although most search and rescue dogs are under the umbrella of AFAD, some are also managed by other public institutions and NGOs. Considering the country's disaster risks, the current number of search and rescue dogs remains insufficient. Therefore, it is necessary to increase the number of trained dogs and handlers in search and rescue operations [1]. In order to prevent disasters and reduce their damages, it is essential to manage all institutions, organizations, and resources of society in line with these common goals by planning, directing, coordinating, supporting, and implementing the activities to be carried out before, during, and after a disaster event. Moreover, reducing disaster damages and preventing disasters can only be achieved through disaster risk management implemented with a multidisciplinary approach. Giving importance to all phases of disaster management is crucial for minimizing losses during disasters. Disaster management is a dynamic and multifaceted process. Establishing light, medium, and heavy-class search and rescue teams in advance, based on the severity of the disaster, will ensure faster progress during the response phase [17].

Accurately determining the capacity of AFAD's dog search and rescue teams will enhance the effectiveness of post-disaster search and rescue operations. This capacity assessment process should encompass a wide range of factors, from the training levels of the dogs to environmental conditions. In addition, regular testing and simulations will be beneficial for improving team competencies.

To increase the capacity of dog search and rescue teams, the following recommendations have been proposed: establishing more positions for dog training specialists, developing regulations and a legal framework, addressing the lack of certification, improving job descriptions, organizing and enhancing working conditions, and providing additional incentives and motivational resources for trainers. In this way, the effectiveness of dog search and rescue teams can be further improved, response times in disasters can be reduced, and the number of lives saved can be increased.

Compliance with ethical standards

Disclosure of conflict of interest

No conflict of interest to be disclosed.

Statement of ethical approval

This study follows rigorous ethical standards to safeguard participants' rights, privacy, and well-being.

Statement of informed consent

Before participation, individuals will provide informed consent, ensuring they have a clear understanding of the study's objectives, procedures, and voluntary nature. Strict confidentiality measures will be maintained, with all personal data securely stored and anonymized to prevent identification. Participants will retain the right to withdraw at any stage without any negative consequences, ensuring their autonomy and comfort throughout the research process.

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