

ORIGINAL RESEARCH



The establishment of the health disaster coordination center (SAKOM) in Turkey and the management of disaster and mass casualty incidents: an official document analysis study

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Abstract

Background: Societal resilience against disasters and mass casualty incidents (MCIs) depends significantly on robust disaster organizations and systems established during the preparedness phase. In Türkiye, the Ministry of Health's Health Disaster Coordination Center (SAKOM) is a key entity in managing the health impact of disasters. This study examines the establishment, organization, and current systems used by the SAKOM, revealing the dynamics of a national medical disaster management system. **Methods:** A qualitative research approach was used to analyze official documents published by the Republic of Türkiye Ministry of Health between 2009 and 2024 using the Ready materials, Extract data, Analyse data, Distil (READ) method. **Results:** Twelve of twenty-two documents published by the Ministry of Health over fifteen years were analyzed. Documents containing repetitive information and those not directly related to the SAKOM were excluded. Twelve key documents were identified as primary sources. Three main themes and six sub-themes were identified. The first theme addressed the SAKOM purpose, historical development, and guidelines, including the structure of Provincial SAKOMs. The second theme is a detailed event reporting criteria, the SAKOM activation processes, and the organization of 112 Emergency Call Centers. The role of the Health Command and Control Center in the activation and incident tracking was highlighted. The third theme analyzed the electronic systems used by the SAKOM, such as the Incident Management System and the Emergency Health Automation System, covering incident management and data integration processes. **Conclusions:** This study provides insight into the SAKOM's operational principles and its role in Türkiye's health management during disasters and MCIs, contributing to global knowledge on disaster management systems.

Keywords

Emergency medicine; Disaster management; Mass casualty incidents; Earthquakes; Health disaster coordination center; Türkiye; 112 Emergency call centers; Incident management system; Medical disaster resilience

1. Introduction

Disasters arise from a complex interplay of factors, including natural phenomena, human actions, technological failures, and the inherent vulnerabilities within communities [1]. A review of the literature reveals a bifurcation of disasters into natural and man-made categories, with a number of entities such as the American Red Cross adopting broader terminology such as emergencies and natural disasters [2]. Despite the existence of various classifications, a universally accepted definition of disaster remains elusive. The criteria for defining disasters span the nature of the disaster (whether natural or man-made), its duration, the extent of its impact on individuals

and communities, its potential for occurrence, and the scale of response it necessitates [3]. An event's classification as a disaster requires a nuanced evaluation of these five interconnected and subjective factors. This complexity has led to the adoption of the term mass casualty incidents (MCIs) for situations that exceed the coping capacities of local governance and healthcare systems [4]. However, even within the realm of MCIs, definitions vary, with the World Health Organization (WHO) characterizing them as incidents that generate more casualties than can be managed with local resources under standard procedures [5]. The determination of an event as an MCI or disaster is influenced by several factors: the number of affected individuals; the geographical scope; the availability

of local and national resources; the impact on societal norms; the event's onset; recovery duration; severity; and the efficacy of the response efforts. Nonetheless, the subjective nature of these criteria presents challenges in measurement, detection and the establishment of a universally applicable definition, perpetuating confusion and debate over the appropriate classification of such events [5, 6]. Accurate identification and categorization are critical for guiding the scope and strategy of the emergency response. The absence of any objective criteria for defining MCIs continues to fuel ambiguity and discussions in the field.

MCIs require various systems within the healthcare system to operate at levels far beyond their normal capacity, from the site of the incident to the prehospital phase, emergency services, and hospital processes. The coordination and management of these processes are of great importance. Therefore, to manage and coordinate MCIs, many countries around the world have established organizations and systems responsible for regional, national and international coordination. Examples of such organizations and systems include the National Incident Management System (NIMS) created by the Federal Emergency Management Agency (FEMA) in the United States and the Incident Command System jointly developed by the Japan Self-Defense Forces, the National Police Agency, and the National Fire Agency in Japan [7, 8]. In Türkiye, the most authoritative institution for disaster management on a national scale is the Republic of Türkiye Ministry of Interior Disaster and Emergency Management Authority (AFAD) [9]. Other institutions and organizations also have disaster management units at both ministerial and local levels within their respective areas of responsibility.

The Health Disaster Coordination Center (SAKOM) was established by the Republic of Türkiye Ministry of Health in 2009 for health management during disasters. Between 2009 and 2023, the SAKOM operated in collaboration and coordination with the Provincial Health Command and Control Centers. Since January 2023, it was decided to establish the Provincial SAKOM organizations in all eighty-one provinces of Türkiye under the oversight of the SAKOM.

The other significance of this date is that just one month after the decision, on 06 February 2023, two earthquakes occurred in the province of Kahramanmaraş, Türkiye, just nine hours apart. These catastrophic earthquakes affected eleven provinces and resulted in the deaths of 53,000 people [10–12]. According to the Emergency Events Database (EM-DAT) from 2009 to 2024, Türkiye experienced 104 MCIs, including the February Kahramanmaraş earthquakes, which alone resulted in the deaths of 53,000 people. The SAKOM has played a role in managing these MCIs, and the establishment of the Provincial SAKOM structures has been accelerated to strengthen the disaster management organizations at the provincial level [13].

The SAKOMs play a crucial role in the national disaster response and are central to disaster medical management. They effectively manage and monitor the entire process from the point of the MCI, through the pre-hospital phase, emergency services, mortality, hospital intensive care and inpatient admissions. This comprehensive management positions the SAKOM as a pivotal example of the medical management approach to disasters in Türkiye. However, these changes

and developments in the SAKOM structures have mostly been documented through official documents, and there is a lack of both national and international research on the topic in the literature. However, the success of nationally established organizations and systems depends on the sharing of resources and experiences, coordinated disaster preparedness, disaster management during disasters and information communication through common, interoperable approaches. Therefore, national disaster management systems in numerous countries are still in the process of development and discussion. However, because these systems are primarily established, developed and monitored through official communications, research on them is extremely limited.

The aim of this research is to examine the establishment process of the SAKOM, an organization developed for the management of disasters and MCIs in Türkiye, and to explore its evolution through experience gained from various disasters, its current hierarchy, and the systems it uses for disaster management.

2. Methods

2.1 The study design

This study adopts a retrospective, qualitative design to investigate the establishment and operational framework of the Health Disaster Coordination Center (SAKOM) established by the Republic of Türkiye Ministry of Health. The analysis was conducted using the READ (Review, Evaluate, Analyze and Design) method, a systematic approach recommended for evaluating health policies [14]. The data sources included official documents, circulars and declarations issued by the Republic of Türkiye Ministry of Health, which were systematically reviewed and analyzed to ensure a comprehensive understanding of the SAKOM's structure and function.

2.2 The general framework of disaster management in Türkiye

The Türkiye Disaster Response Plan (TAMP), which encompasses ministries, institutions, organizations, private entities, nongovernmental organizations, and individuals responsible for responding to all types and scales of disaster and emergency in Türkiye, was established in 2011. According to the TAMP, disaster management is structured around twenty-six distinct components [15]. These components are as follows: (1) Search and Rescue; (2) Sheltering; (3) Information Management, Monitoring and Assessment; (4) Service Group Logistics; (5) Resource Management; (6) Chemical, biological, radiological, nuclear (CBRN); (7) Accounting, Budget and Financial Reporting; (8) Purchasing and Leasing; (9) National and International Funds; (10) International Support and Coordination; (11) Warehouse Management and Distribution of Donations in Kind; (12) Psychosocial Support; (13) Infrastructure; (14) Debris Removal; (15) Damage Assessment; (16) Energy; (17) Food, Agriculture, and Livestock; (18) Security and Traffic; (19) Evacuation, Settlement and Planning; (20) Fire; (21) Burial Services; (22) Communication; (23) Transport; (24) Transport Infrastructure; (25) Technical Support and Supply; and finally (26) Health.

The organization responsible for health management, one of these twenty-six components, is the Ministry of Health at the national level and the Provincial Health Directorates at the local level (the units of the Ministry of Health operating in the provinces). To ensure effective medical management of disasters at both national and local levels, the Ministry of Health established the SAKOM (Health Disaster Coordination Center) structure. This includes the central SAKOM and its corresponding provincial SAKOM units.

This study examines the SAKOM structures that are involved in the medical management of disasters.

2.3 The data collection

For this research, the official electronic and printed declarations published by the Republic of Türkiye Ministry of Health, General Directorate of Emergency Health Services, between 2009 and 2024, listed in Table 1, were reviewed chronologically. The research data were retrospectively collected in 2024. These declarations were sent to the provincial administrators and are not publicly available online. They were examined for specific information regarding the establishment, structure and operational framework of the SAKOM.

The primary focus was on identifying the following:

1. Operational Processes: Details of the SAKOM activation and management during disaster scenarios.
2. Roles and Responsibilities: Assignments and duties of personnel within the SAKOM at both the national and provincial levels.
3. Coordination Protocols: Procedures for inter-agency and intra-agency communication and collaboration.
4. Resource Allocation: Guidelines for deploying medical teams, equipment and supplies during emergencies.

A total of twenty-two documents containing information about the SAKOM were examined. Documents containing repetitive information and those not directly related to the SAKOM were excluded. As a result, twelve key documents were identified as the primary sources (Table 1). These key documents are provided in chronological order of their publication date.

Certain documents were excluded based on specific criteria to ensure the relevance and quality of the data analyzed in this study. These were: (1) Documents containing repetitive information already covered in other materials; (2) Documents not directly related to the SAKOM's establishment, structure or operational framework; (3) Documents lacking sufficient detail or clarity regarding disaster management practices; and (4) Documents published outside the 2009–2024 timeframe.

As a result, only twelve key documents that met the inclusion criteria and provided relevant insight into the SAKOM's operations were included in the analysis.

2.4 The data analysis

The twelve selected key documents were analyzed using the READ method, which involves the following: reading the material to understand the content and context; examining the documents to identify key themes and patterns; analyzing the data to determine the implications for health policy and disaster management; and developing a comprehensive understanding

of the organizational structure and operational strategies of the SAKOM.

The two researchers reached a consensus on three main themes appropriate for the study's objectives and identified a total of six sub-themes based on the content of the data. The analysis focused on identifying and selecting expressions and information within the documents that aligned with the study's objectives. These expressions were carefully extracted and used to support the identified themes and sub-themes. The alignment of these subthemes was also monitored by both researchers. Table 2 provides the main themes and subthemes along with their respective content. During this process, the definitions, duties, and responsibilities outlined in the documents were carefully analyzed and referenced against the established criteria, using the twelve key documents.

The documents were numbered in numerical order based on their publication dates. In the Results section, when information is derived from these documents, the corresponding document number is provided in square brackets at the end of the sentence.

The Results section was structured chronologically, focusing on the establishment of SAKOM as the primary reference point. Consequently, documents related to structures subsequently integrated into the SAKOM framework appear earlier in the Results section despite having later publication dates.

As a result, the document numbering in the Results section is not strictly numerical, as it follows the chronological development of SAKOM rather than the document publication dates.

The research findings and organizational hierarchy will be supported with visual materials. The SAKOM Data Distribution Diagram and processes related to the Incident Management System will be explained using graphs. These visuals have ensured that the research findings are more understandable and accessible (Fig. 1). Using this method, a comprehensive and systematic compilation of the SAKOM's establishment process, organization and the systems it utilizes is presented. The official documents and regulations used in this study detail the structure and duties of the SAKOM and provide significant insight into disaster and emergency management in Türkiye. This approach has helped us understand how the SAKOM and its related units operate effectively and how these processes are coordinated.

The documents used in this research are official letters, circulars, and declarations published by the Republic of Türkiye Ministry of Health (TCSB). These documents provide accurate and reliable information in regard to the establishment and functioning of the SAKOM. Through content analysis, the documents were carefully examined, and the definitions, duties, and responsibilities were coded according to a predetermined criterion.

The READ method, a well-accepted and reliable approach in health policy research, was employed in this study. An independent qualitative research expert voluntarily reviewed the research to enhance its accuracy and the reliability of the data. The expert had no conflict of interest, financial or otherwise, related to this study. This review was conducted independently and without influence from the study's findings or conclusions.

TABLE 1. The official documents on SAKOM published by the republic of Türkiye ministry of health.

| Document | Document Number | Document Title | Date |
|----------|------------------------|------------------------------------------------------------------------------|-------------------|
| Doc-1 | 39942537/952.06.03 | About SAKOM | 24 December 2015 |
| Doc-2 | 39942531-663.09-E.8643 | Hospital bed count | 28 September 2016 |
| Doc-3 | 67523305-719-E.7050 | Incident disaster notification | 28 December 2016 |
| Doc-4 | 67523305-719-E.7053 | Incident disaster notification | 28 December 2016 |
| Doc-5 | E-24929371-042-E.8 | Incident disaster notification | 10 January 2017 |
| Doc-6 | 67523305-719-E.231 | Incident disaster information package | 11 January 2017 |
| Doc-7 | 39942531-319-E.358 | Hospital coordination | 11 January 2017 |
| Doc-8 | 39942531-702.01-E.2148 | Incident management system and hospital coordination system | 07 March 2017 |
| Doc-9 | E-39942531-319.E.2613 | Events to be reported to SAKOM | 11 April 2018 |
| Doc-10 | E-39942531-319.E-3286 | Personnel to be assigned to report to SAKOM | 03 May 2018 |
| Doc-11 | E-97014916-319-E.785 | Integrations and data package transmission processes | 04 May 2018 |
| Doc-12 | E-29341019-303.99 | Directive of the Ministry of Health Disaster and Emergency Management Center | 02 January 2023 |

SAKOM: The Ministry of Health's Health Disaster Coordination Center.

TABLE 2. The themes formed by the classification of the data in the research.

| Theme | Subtheme | Functions of the Theme |
|---------------|----------------------------------------------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Establishment | Establishment and Development Process of SAKOM | Focuses on the purpose of SAKOM establishment, its historical development, guidelines, and the establishment, structure, and operation of provincial SAKOMs. |
| | Notification Criteria and Activation of SAKOM | Details of the identification of incidents requiring notification to SAKOM, assessment of these incidents, and the activation processes of SAKOM. |
| | 112 Emergency Call Centers | Examines the structure, operation, and features of the system consolidating various emergency call numbers in Türkiye, and its organization and activities at the provincial level. |
| Systems Used | Duties and Responsibilities of the Health Command and Control Center | Addresses the role of Health Command and Control Centers in SAKOM activation, changes in duties, incident monitoring, and coordination responsibilities. |
| | Incident Management System | Analyzes the operation, use of the Incident Management System, data flow between SAKOM and hospitals, and coordination role. |
| | Incident Management in Emergency Health Automation System (ASOS) | This section examines incident management the Emergency Health Automation System, data entries, integration with SAKOM, and processes for filling out and updating incident notification forms. |

SAKOM: The Ministry of Health's Health Disaster Coordination Center.

3. Results

3.1 Theme: establishment and development of SAKOM

The SAKOM was established within the Republic of Türkiye Ministry of Health in 2009 to ensure twenty-four-hour daily coordination of health services during all types of emergencies, unusual situations and disasters (Doc-1). The organization's ability to quickly access accurate information and data is one

of the most critical aspects of crisis management. Therefore, since its establishment, it has been meticulously monitored by the Republic of Türkiye Ministry of Health.

When evaluated chronologically, the SAKOM was established as a "central organization" by the Republic of Türkiye Ministry of Health. Over time, it became clear that there was a need for units closer to disaster-prone areas that could take rapid action, leading to the creation of the current Provincial SAKOM structures. As of today, one central SAKOM and

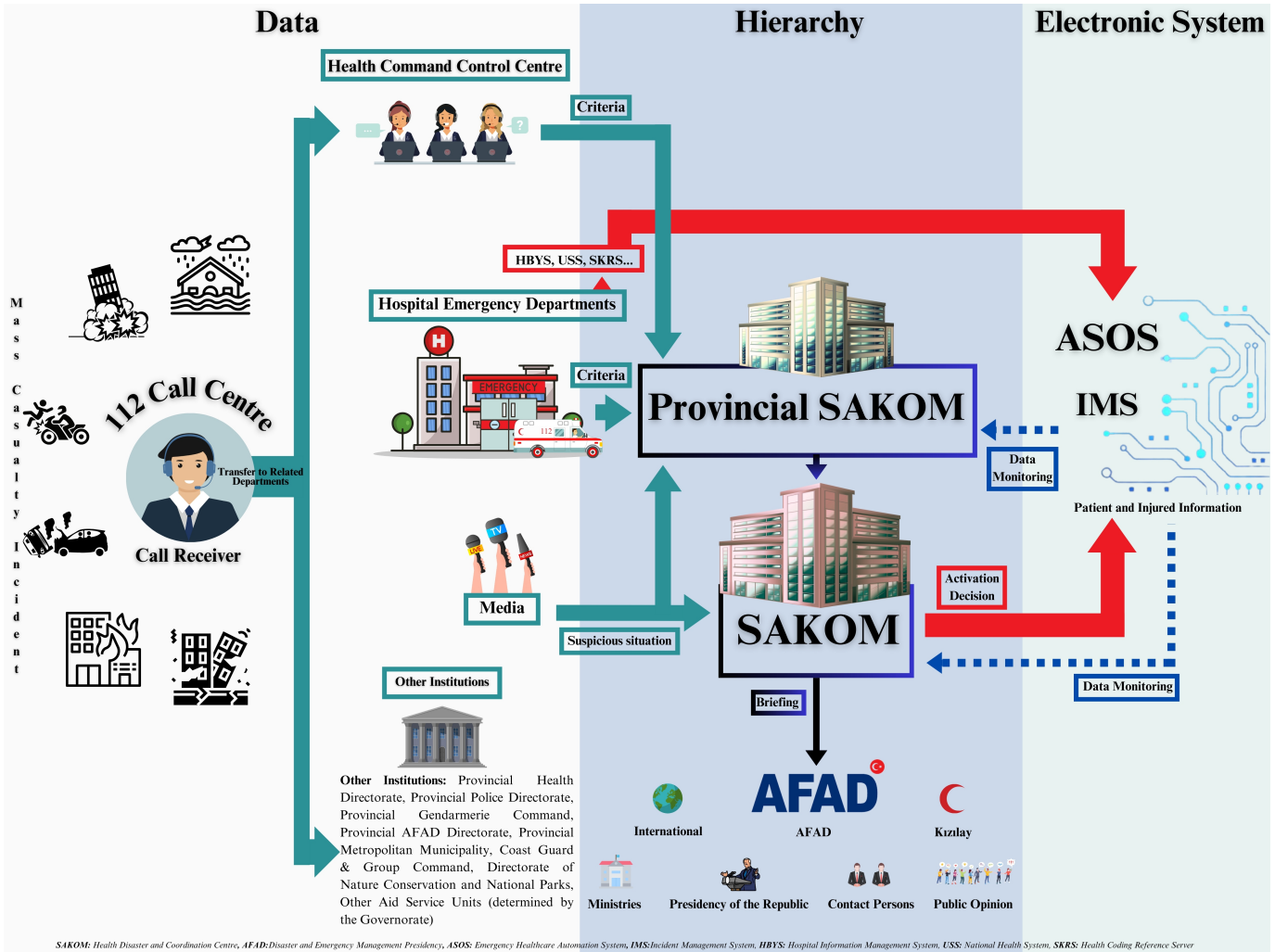


FIGURE 1. The SAKOM’s information sources, management hierarchy and Electronic System Management.

eighty-one Provincial SAKOM structures are operating under its supervision. Upon reviewing the documents, it is evident that the Provincial SAKOM centers in cities originated from the Health Command and Control Centers of the 112 Emergency Call Centers (Doc-12).

The main purpose of the Provincial SAKOMs is to quickly learn about incidents in the field through various sources, organize the response at a provincial level, and inform the central SAKOM according to the communication hierarchy. For this purpose, the Provincial SAKOMs form the foundation of a medical communication center in the event of a disaster within their respective provinces. Due to the primary focus on communication, during their establishment phase, the Provincial SAKOMs installed high-frequency radio systems early on, and satellite phones were also deployed to these centers across the provinces.

The Disaster Communication System undergoes satellite phone tests between the provinces on dates determined by the Republic of Türkiye Ministry of Health to ensure operational readiness in the event of any potential disaster. Real MCI monitoring is conducted through the high-frequency radio provincial SAKOMs; however, monitoring can be challenging for a single person on duty. Therefore, in incidents requiring notification to the SAKOM, the responsible physician on duty at

the Health Command Center contacts the Provincial SAKOM unit to initiate the initial response. MCIs occurring in cities are considered “peripheral”, so notifications of incidents to the SAKOM are handled by the Provincial SAKOMs; disaster information flows from the periphery to the center (Doc-12). Additionally, when patients or injured individuals who have not been transported by one of the emergency response teams arrive at hospital emergency departments on their own, hospital administrators contact the Provincial SAKOM concerned to provide information, and notification to the SAKOM is also carried out by the Provincial SAKOM. Upon receiving notification of an MCI, the Incident Management System is activated by the SAKOM immediately, and all injuries related to the MCI are tracked through this system (Doc-8). Although the Incident Management System is activated by the SAKOM, the unit responsible for tracking the injured and disaster-affected patients reported to the Incident Management System is the Provincial SAKOM. The provincial SAKOM’s information sources, and the alert hierarchy of the SAKOMs for an MCI occurring in the field, are shown in Fig. 1.

Before the 6 February earthquakes, not all the provinces in Türkiye had provincial Health Disaster Coordination Centers (SAKOM). As shown in Table 3, the establishment of the SAKOM structures across the country was based

TABLE 3. Group definitions based on population according to the data of the Türkiye statistical institute.

| Province classification | Population density of provinces |
|-------------------------|-------------------------------------------------------------|
| P1 | Provinces with a population exceeding 10,000,000 |
| P2 | Provinces with populations between 4,500,000 and 10,000,000 |
| P3 | Provinces with populations between 3,500,000 and 4,500,000 |
| P4 | Provinces with populations between 2,500,000 and 3,500,000 |
| P5 | Provinces with populations between 1,500,000 and 2,500,000 |
| P6 | Provinces with populations between 720,000 and 1,500,000 |
| P7 | Provinces with populations between 500,000 and 720,000 |
| P8 | Provinces with populations between 250,000 and 500,000 |
| P9 | Provinces with populations of less than 250,000 |

P: Province.

on population-based group classifications based on data from the Turkish Statistical Institute [16]. The process of establishing the Provincial SAKOMs proceeded as follows: in the first phase, separate from the Health Incident Command Center, it began in the P1, P2 and P3 group provinces; in the second phase, a separate provincial SAKOM under the presidency was established in the P1, P2, P3, P4, P5 and P6 group provinces; while the P7, P8 and P9 group provinces decided to integrate the Provincial SAKOM within the health Incident Command Center framework within the 112 Emergency Call Centers (Doc-12). In Türkiye, the Provincial SAKOMs have been recognized by the Republic of Türkiye Ministry of Health as the effective factors in management algorithms and disaster resilience, particularly in disasters affecting specific regions. The Provincial SAKOMs coordinate their tasks with other Provincial SAKOMs during MCIs. Consequently, just one month before the 06 February earthquakes in Kahramanmaraş, a new directive was issued, and a decision was made to establish Provincial SAKOMs in all the provinces (Doc-12). The purpose of this decision was to regulate the organization, establishment, working principles, as well as the duties, authorities, and responsibilities of the Provincial SAKOMs established under the SAKOM and Provincial Health Directorate (Doc-12). However, during the earthquake period, a number of provinces were still in the process of establishing the Provincial SAKOMs. Following the 06 February earthquakes, the Republic of Türkiye Ministry of Health established special teams to accelerate the establishment of the Provincial SAKOMs in provinces where they were not yet established, aiding in their establishment. As of today, the Provincial SAKOM structures have been established in all of the eighty-one provinces of Türkiye.

3.2 Theme: the organization of the SAKOM

The identification of events requiring notification to the SAKOM, assessment, and detailed explanation of the SAKOM activation processes are provided (Doc-9, Doc-10). The structure and operation of the 112 Emergency Call Centers, which form the basis of the SAKOM and the Provincial SAKOMs in Türkiye, along with the system that integrates various emergency call numbers, were examined. Additionally, the organization at the provincial level was

analyzed. The role of the Health Command Control Center in the SAKOM activation, and its responsibilities in task changes, incident tracking, and coordination are emphasized (Doc-9, Doc-10, Doc-12).

3.2.1 Subtheme: the notification criteria and the SAKOM activation

During its establishment and development over time, one of the most fundamental determinations for the SAKOM was under which events it would be activated. Therefore, the situations requiring notification to the SAKOM were defined in detail in 2018, as outlined in Table 4 (Doc-9).

In all the provinces, there are three main sources for the entry of an MCI into the system. One of these is when an eyewitness or injured person calls the 112 Emergency Call Center. Upon receiving a call with patients or injured individuals, the 112 Emergency Call Center activates the health Incident Command Center and other relevant public agencies in the provinces. When an MCI occurs, the first 112 team to arrive at the scene gathers information regarding the nature of the incident, the number of patients/injured, and their triage codes. Upon determining that an incident is an MCI, the Health Command and Control Centers activate the Provincial SAKOM, which in turn activates the SAKOM, ensuring that MCI information is transmitted centrally (Doc-12). In the event of an MCI meeting the criteria in a province, the SAKOM shall be notified as soon as possible. Subsequently, the SAKOM decides whether to activate the Incident Management System. When multiple incidents occur simultaneously, to avoid confusion in patient/injured entries, the incident notification officer assigns an “incident number” to each event and informs the hospitals. According to the alert sent to the hospital automation system case entries related to the incident are made based on the “incident number”. This ensures that both the Crisis Coordination Center and the SAKOM have accurate and real-time data on patients/injured individuals. This process is crucial for data management and coordination, to improve incident management. It can be said that this practice allows for a more organized response both in the field and in hospitals, facilitating more effective tracking of patients/injured individuals (Doc-3, Doc-4, Doc-5, Doc-6). When the Incident Management System is activated, promptly

TABLE 4. Situations requiring SAKOM notification.

| Incidents | Incidents Characteristics |
|-------------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Dependent on the number of people | <p>In traffic accidents, if there are at least five deaths or ten or more injured.</p> <p>In cases of CO exposure, fires, civil conflicts or armed attacks; if the number of affected people is five or more.</p> <p>Any mass food, drinking water, or inhalation exposure (unknown odor and so on) that threatens human health (affecting five or more people).</p> |
| Independent of the number of people | <p>Incidents involving security personnel (police, soldiers, guards) exposed to terror-related activities (Operations, Conflicts, Improvised Explosive Devices, Landmines) and traffic accidents involving official vehicles (police/military vehicles).</p> <p>Any type of explosion (natural gas, terror, industrial and so on).</p> <p>Any incident potentially related to CBRN (terror, industrial accident, explosion and so on).</p> <p>Any natural disaster (earthquake, flood, avalanche, landslide, rockfall and so on).</p> <p>Any mining accidents.</p> <p>Fires (health facilities belonging to our Ministry, official institutions and organizations, refineries, ships, forest fires, factories and so on).</p> <p>Any social events (strike, lockout, demonstration, protest and so on).</p> <p>Ambulance accidents and other injury-causing accidents involving personnel working in Emergency Health Services while on duty.</p> <p>Any incidents involving well-known or prominent individuals (politicians, artists, businessmen and suchlike) that are likely to be reported in the media.</p> <p>Any sea, rail or air vehicle accidents.</p> <p>Incidents of refugees being stranded at sea, accidents and disappearances while trying to cross into other countries illegally within our national borders.</p> <p>Search and rescue operations in challenging climate, natural, and geographical conditions.</p> <p>Any incident that is reported in the national media.</p> <p>Any information request from SAKOM or Provincial SAKOM.</p> |

SAKOM: The Ministry of Health's Health Disaster Coordination Center; CBRN: Chemical, Biological, Radiological and Nuclear.

entering data into the system is crucial to enable real-time tracking of patients/injured individuals related to the incident reported to the SAKOM. This includes vital threat status, the Glasgow Coma Scale, examinations, laboratory results, imaging and discharge/admission details. Timely data entry is essential because, depending on the scale of the incident, information is provided to the hospital where patients are being transported. Hospitals prepare their emergency departments and, if necessary, wards, operating rooms and intensive care units. For cases arriving at emergency departments by way of the 112 emergency medical teams, on foot or by other means, it is ensured that data entry into the Incident Management System package is conducted through the alert system in the hospital's automation system, indicating the occurrence of this MCI (Doc-7, Doc-8).

One of the most important information sources for the Provincial SAKOM is the emergency departments of public and private hospitals. In the event of multiple injuries and patient admissions to emergency departments, the Provincial SAKOM is directly notified, which in turn activates the SAKOM. With the activation of the Provincial SAKOM and the SAKOM, the systems are initiated, and hospital

organizations are organized. Another source of information for the system is the media. When an incident is reported in the media and meets the criteria, both the Provincial SAKOM and the SAKOM can act automatically. The activation hierarchy of the proposed system is illustrated in Fig. 1.

To ensure standardization in the provinces, the Republic of Türkiye Ministry of Health issued a directive in 2018 that classified the incidents to be reported to the SAKOM and established an incident reporting format to standardize information sources (Doc-9). In this way, the incidents considered as MCIs were standardized. Along with the criteria, procedures were established to address any lack of information at the provincial level regarding who the notification officer is and the steps involved in the notification process. Along with the criteria, procedures were established to address any lack of information at the provincial level regarding who the notification officer is and the steps involved in the notification process. Additionally, procedures to follow in MCI. The SAKOM is unable to reach provincial managers after an incident is defined (Doc-10). To avoid notification issues during incidents, "Incident Notification Officers" have been designated to be directly and primarily responsible for reporting to the SAKOM after an

MCI. The selection of Incident Notification Officers was left to the provincial health directorates. Since the first emergency call is made to the Health Command and Control Center, Incident Notification Officers comprise doctors assigned to the Health Command and Control Center. Incidents meeting the criteria outlined in Table 4 are considered MCIs and trigger the activation of the SAKOM. Consequently, both the Provincial SAKOM and the SAKOM continuously receive, assess, and report information from all news sources every day for twenty-four hours. They provide updates to administrators, and when necessary, monitor the process based on received instructions, coordinate the health services with national and international organizations during disasters and emergencies, collect disaster and emergency reports from provinces, monitor and address reported deficiencies, initiate actions to rectify these deficiencies, and assign personnel responsible for delivering the health care services in disaster situations.

3.2.2 Subtheme: the 112 emergency call centers

To discuss the SAKOM structure in Türkiye, it is essential to first explain the Emergency Call Centers. In EU member countries, “112” is used as the Emergency Assistance Number, similar to “911” in the United States. On 29 July 1991, the European Union decided that the 112 lines should be used as the “Single European Emergency Call Number” in all member countries. The Emergency Call Centers in Türkiye also operate through a single number (112) for emergencies, integrating various emergency assistance numbers (such as 112, 155, 156 and 110) into one system (see Fig. 1) [17].

Emergency Call Centers handle calls related to public order and security, individual health and safety, community health, and direct them to the relevant institutions. Call handlers, who are the first responders to emergency calls, transfer calls to dispatchers from the relevant institutions, such as the health services, police, gendarmerie and fire departments based on the nature of the emergency. If a call concerns a situation affecting human health, it is classified as a “Health Emergency Call” and directed to the Health Command and Control Center operating on behalf of the Provincial Health Directorate. If the situation is deemed an MCI, the call center can directly activate the SAKOM [16]. Therefore, Emergency Call Centers are the strategic first point of contact and activation point for the system, and they often report MCIs occurring in the field. They collectively activate the public institutions responsible for managing an MCI and ensure that all the relevant organizations in a province are promptly informed in the early stages of an MCI.

3.2.3 Subtheme: the duties and responsibilities of the health command and control center

During the initial establishment of the SAKOM structure, calls directed to the Health Command and Control Center by the 112 Emergency Call Centers lead to the direct activation of the SAKOM if the incident is classified as an MCI. However, following the establishment of the Provincial SAKOMs in 2023, the Health Command and Control Center now reports such incidents directly to the Provincial SAKOM,

which then handles further follow-up and information transfer to the SAKOM (Doc-12).

Health Command and Control Centers operate under the direction of the Provincial Ambulance Service Chief Physician’s Office. This system is designed to ensure rapid and effective response to emergencies. All processes are conducted according to the established procedures and regulations.

Apart from this communication network, the Health Command and Control Centers hold a crucial role in MCIs. Personnel designated to work in the Provincial SAKOMs, including medical staff with titles such as physicians, Emergency Medical Technicians, and nurses, are assigned from the Health Command and Control Centers. Therefore, most of the personnel working within the Provincial SAKOMs structure, which is the primary organization responsible for the medical disaster management in the province, are Health Command and Control Center employees.

3.3 Theme: the systems used by the SAKOM

In the third theme, the Incident Management System and Emergency Health Automation System are analyzed, focusing on incident management, data entries, integration with the SAKOM, and the processes of filling out and updating incident notification forms.

3.3.1 Subtheme: the incident management system

The Incident Management System is an electronic system activated by the SAKOM when an MCI occurs in the provinces, ensuring rapid and effective coordination. To centralize the information of individuals presenting to emergency services during MCIs, to view the data from a single source and to prevent misinformation, the General Directorate of Health Services, the General Directorate of Health Information Systems, and the General Directorate of Emergency Health Services jointly launched the “Incident Management System” project on 06 January 2017, in all eighty-one provinces (Doc-5, Doc-6, Doc-7, Doc-8).

In the event of an incident meeting the SAKOM notification criteria outlined in Table 4, an object named “Event Disaster Information” has been defined in the “Patient Registration Package 101” to send data from the field to the National Health System. The SAKOM instantly adds event information to the Health Coding Reference Server. The Incident Management System accesses the information of patients admitted to hospitals following these events through the Hospital Information Management System and includes it in the event package. Therefore, it is crucial that the “Event Disaster Information” code in the updated services of the Health Coding Reference Server is updated by the Hospital Information Management System software companies at least every ten minutes. Through the Hospital Information Management System, an Event Disaster Information Package is prepared within the National Health System (Doc-3, Doc-4, Doc-5). In this manner, both the patient information from the incident site and the details of the injured individuals admitted to hospitals are included in the event package through the Incident Management System, making it possible to monitor everything from a

single center. Not only are the details of the injured patients from hospitals included, but also the logistical information necessary for incident management, such as hospital bed occupancy and personnel status, are integrated using the Bed Information Package and the On-Duty Personnel Information Package (Doc-2, Doc-6, Doc-7, Doc-8). This allows the logistical status of hospitals affected by the incident to be tracked dynamically. Within the Hospital Bed Information Package, specific patient groups are identified. These areas include areas of strategic importance for hospital transfer and referral management in mass incidents, such as neonatal intensive care, pediatric intensive care, burn units, and level three intensive care units. These areas are closely and dynamically monitored because they are central to hospital disaster resilience. To integrate hospitals into the Incident Management System and enable dynamic tracking, the Hospital Coordination System is in place. All public, private, and university hospitals must be integrated into this system and are required to keep their information updated (Doc-2, Doc-6, Doc-7, Doc-8). By adding the Incident Management System module to the Emergency Health Automation System software, hospitals can query the event disaster information added by the SAKOM from the Health Coding Reference Server at ten minute intervals. This ensures that individuals admitted to emergency services due to an incident, whether through 112 emergency ambulances or other means, are associated with the incident during the patient admission registration. The Event Disaster Information Package is sent to the National Health System without being included in the patient transmission queue, which is crucial for the SAKOM to monitor the incident (Doc-11).

The hospital coordination system allows the hospital bed occupancy status and on-duty physician information to be viewed through the Emergency Health Automation System (ASOS) during mass casualty incidents. If necessary, patient transfers and evacuations are coordinated by the Health Command and Control Centers. This system ensures the rapid clearance of strategically important areas affected by incidents, thereby facilitating dynamic incident management. Transfer systems, decisions, and management are conducted by the Health Command and Control Centers.

3.3.2 Subtheme: the incident management in the emergency health automation system (ASOS)

The Incident Notification Form, referred to as the Blue Form by the Republic of Türkiye Ministry of Health's SAKOM unit, is initially completed and sent to the SAKOM by way of email (Doc-9). Subsequently, as hospitals enter data, updates with the date and time stamps are sent through update forms. When an incident that must be reported to the SAKOM occurs, an "incident package" is created by the SAKOM (Doc-3). Patients/injured individuals affected by the incident, who reach emergency services either by way of 112 emergency ambulances or by their own means, must be associated with the incident when they are registered in the Hospital Information Management System (Doc-4, Doc-5). After sending the patient record related to this incident to the 101 packages (Patient Registration Section in the e-Nabız guide), the Hospital Information Management service must also send the

Incident Disaster Information Package to the 261 packages (Incident Disaster Information Section in the e-Nabız guide) (Doc-6, Doc-7, Doc-8). While patient information related to these incidents is transmitted to National Health System, it must be sent without being included in the patient transmission line. The Emergency Health Automation System is integrated with the National Health System; therefore, information sent to the Incident Disaster Information Package can be viewed in the Emergency Health Automation System. In this way, the SAKOM can track patients/injured individuals who are affected by the incident (Doc-8, Doc-11).

4. Discussion

The SAKOM is a Disaster-Health organization created by the structure of the Ministry of Health in Türkiye, where information sources consisting of central and peripheral components for medical management of disasters are identified. Events are differentiated as incident/MCI based on certain criteria, a systematic information flow chart, and dynamic information flow from the periphery to the center.

Incidents requiring emergency intervention, such as MCIs, encompass elements of preparedness, mobilization, operation and resilience. The broad scope of responsibilities and the dynamic tasks that emerge complicate emergency response efforts. Managing this complexity necessitates rapid and effective intervention both during and after any MCI [18]. Therefore, to address this complexity dynamically, systems that respond to disasters are managed with a specific hierarchy, starting from regional levels and extending to national and international responsibility pyramids. This hierarchical approach aims to ensure a structured and efficient response to emergencies. Community-based and state-supported disaster organizations are in place to facilitate these interventions. In Türkiye, an example of an official organization for disaster management is AFAD, while the SAKOM is responsible for managing the health aspects of MCIs.

The AFAD's mission is to conduct the necessary work for the effective management of disaster and emergency processes, ensure coordination among relevant institutions and organizations, and develop policies in this field. In contrast, the SAKOM's role is to continuously monitor and manage crises related to human health in Türkiye and worldwide during disasters and extraordinary situations that disrupt or halt normal life and activities, requiring emergency intervention. The SAKOM collects and uses information for managing these processes, sharing real-time updates with relevant authorities and institutions when national or international coordination is necessary [19, 20]. When examining the organization and hierarchy of the SAKOMs, it becomes evident that they possess a robust infrastructure for incident identification, communication coordination, and the dynamic tracking and management of MCIs.

The classification of an incident as an MCI fundamentally depends on the adequacy of the response that can be provided [21]. However, determining the adequacy of the response in the MCIs involves considering multiple parameters, including the source of the incident, the number of affected individuals, the social and economic impact on the community, the societal

segments affected by the incident, and the location where the incident occurred [22, 23]. Since 1988, the Emergency Events Database (EM-DAT), maintained by the Center for Research on the Epidemiology of Disasters (CRED), has used the following three quantitative inclusion criteria: at least ten deaths (including missing persons); at least one hundred people affected (injured, displaced or otherwise impacted); and a declaration of a state of emergency or an international call for assistance. For historical events where quantitative data may not be available, secondary criteria are employed, such as “the worst disaster in a country’s or region’s history” or “an event resulting in significant damage” [24]. The SAKOM criteria, similar to the EM-DAT inclusion criteria, are based on both quantitative and qualitative data. On a global scale, there are guidelines that define MCIs solely using qualitative data. For instance, the Pan American Health Organization (PAHO) defines an MCI as a single event that negatively impacts a community and results in a number of fatalities that exceed the community’s normal response capacity [25]. The WHO defines MCIs as disasters and major events characterized by the number, severity, and variety of patients that can rapidly overwhelm the ability of local medical resources to provide comprehensive and definitive medical care [26]. Perhaps the most limited aspect of the MCI management guidelines published by both the PAHO and the WHO is the incident identification process. These definitions are often left to subjective decision-making mechanisms. While these definitions are extremely inclusive, defining the incident with more quantitative criteria at the onset can sometimes expedite the identification and activation process. Quantitative data for incidents requiring a SAKOM notification primarily pertain to traffic accidents (with at least five fatalities or ten or more people affected) and situations such as CO poisoning, fires, civil conflicts or armed attacks, where the number of affected individuals is five or more. When examining the Eastern Pennsylvania Emergency Medical Services (PA EMS) Council Disaster Operating Guidelines (DOG) Field Guide, two notable aspects emerge; the definition of MCIs based on the number of casualties, and the categorization of MCIs according to the number of casualties [27]. When examining the SAKOM criteria from this perspective, it is evident that there is no categorization or scaling of an incident or its magnitude. A number of organizations categorize incidents based on the number of patients, while the FEMA has recently published the Incident Complexity Guide as part of the National Incident Management System. This guide categorizes MCIs into five classes based on specific criteria [8]. Considering these global examples, it is necessary to establish criteria for the response-based categorization of MCIs based on regional conditions rather than global standards. Such criteria would facilitate both the pre-planning and post-incident coordination of responses to MCIs.

When examining the SAKOM organization and the hierarchy of systems it uses, it is evident that the SAKOM, through its coordination with the Provincial SAKOMs, aims to encompass both the strong centralized management approach of the NIMS in the United States and the more robust local disaster systems of Japan’s Incident Command System (ICS) [7]. The SAKOM’s ability to transfer information about the

injured and affected individuals from the incident site into an electronic system and track it through centralized systems can greatly facilitate both the management and coordination of a disaster. Consequently, the activation of the Incident Management System following an incident that meets the criteria is one of the system’s focal points. This system aims to provide an initial database to identify vulnerable groups, assets, and areas where resources and efforts need to be directed. In MCIs with a certain regional impact, these data can be documented electronically. However, in catastrophic MCIs, such as earthquakes, the potential for these systems to be damaged due to infrastructure issues (for example, power outages, Internet disruptions) should be considered. Additionally, the risk of these systems being targeted by cyberattacks is another important factor to keep in mind. Following the devastating earthquakes in Kahramanmaraş, Türkiye, on 06 February 2023, coordination became a frequently debated topic [11, 28]. During the disaster, the SAKOMs developed and implemented new medical strategies to address the challenges presented by the emergency [12]. As can be seen in the example of the SAKOM, the initial establishment of the SAKOM, followed by the need for the Provincial SAKOMs, and ultimately the necessity for the SAKOM structures in all provinces, reflects the lessons learned from the disasters Türkiye has experienced since 2009. This organizational cycle demonstrates that while strong national-scale organizations are essential, regional disaster organizations also have a significant impact on resilience during disasters.

The establishment and development process of the SAKOM, based on the literature and the examination of other national disaster management systems, can be summarized into four key recommendations. First, there is the management of complexity: incidents requiring emergency intervention, such as MCIs, involve elements of preparedness, mobilization, operation and resilience. To manage this complexity, the SAKOM must have a robust communication and coordination infrastructure. Second is the quantitative and qualitative criteria: both quantitative and qualitative criteria should be considered when defining MCIs. The criteria established by the SAKOM provide sufficient information to accurately classify the scale and impact of an incident. However, developing more detailed and comprehensive criteria at both global and regional levels can facilitate a more effective and rapid response to MCIs. Third is the strengthening of technological infrastructure: enhancing technological infrastructure, such as the Incident Management System, and ensuring systems are continuously updated is crucial for the dynamic tracking and management of incidents. Integration with the Hospital Information Management System and maintaining a seamless data flow can significantly aid coordination during a disaster. Fourth is training and awareness: for the SAKOM to operate effectively, particularly the personnel working in the Health Command and Control Center, regular training and awareness in disaster management are essential. Additionally, educating the public on how to act during emergencies can reduce panic and chaos during incidents.

5. The limitations of the study

One of the primary limitations of this study is the absence of interviews with individuals involved in disaster management, such as policymakers, emergency responders and administrators. This study is based on the analysis of twenty-two official documents, which results in a relatively small sample size. Incorporating their perspectives could have enriched the findings by providing insight into operational challenges and potential system improvements. Additionally, the study relied solely on document analysis, which may have limited the depth of the understanding of the practical implementation of disaster management strategies.

6. Conclusions

In Türkiye, the current structure, development process and systems of the SAKOM, developed over fifteen years through the experience of managing disasters and MCIs, highlight a robust management hierarchy. This research can guide and provide material for many countries working on disaster and MCI management systems. The SAKOM organization, with its strong centralized and local management approach, is the result of a long process and experience, particularly in the aftermath of recent catastrophic disasters.

AVAILABILITY OF DATA AND MATERIALS

This study is based on the analysis of publicly available official documents, which did not require special research permission. There are no conflicts of interest. The entire de-identified dataset, data dictionary and analytic code for this investigation are available upon request, from the date of article publication by contacting Sarper YILMAZ, Assoc. Prof., at sarperyilmaz08@gmail.com.

AUTHOR CONTRIBUTIONS

GAU—designed the trial. SY—supervised the conduct of the trial and data collection. GAU and SY—conceived the study; undertook recruitment of the participating centers and patients and managed the data, including quality control; provided statistical advice on study design and analyzed the data; chaired the data oversight committee; drafted the manuscript, and both authors contributed substantially to its revision; assume responsibility for the paper as a whole.

ETHICS APPROVAL AND CONSENT TO PARTICIPATE

Although this study is based on the analysis of publicly available official documents and does not involve human participants, ethical approval was obtained from the İzmir Provincial Directorate of Health Tepecik Training and Research Hospital Non-Interventional Clinical Research Ethics Committee (Approval number 2024/06-07, dated 02 July 2024) in accordance with institutional requirements. Since this study was based on the analysis of publicly available official documents

and did not involve human participants, the İzmir Provincial Health Directorate Tepecik Training and Research Hospital (İzmir/Turkey) Non-Interventional Clinical Research Ethics Committee approved the exemption from informed consent.

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CONFLICT OF INTEREST

We confirm that research permission was obtained for this study. Additionally, the authors declare that there is no conflict of interest related to this research.

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