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# Investigating the Response Time to Disasters in the Red Crescent Society by Province and Type of Disasters: A Descriptive Study

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**Original Article**

## Abstract

**INTRODUCTION:** Disasters, both natural or manmade, have been a serious threat to human life and property for many years. The shortest response time is certainly the most important factor in increasing the survival of victims in disasters. Considering the vital importance of time in relief operations, the aim of this study is to investigate the response time in various incidents and disasters by the aid workers of the RCS by the provinces of the country during the years 2012 to 2020.

**METHOD**: This descriptive-quantitative study is cross-sectional and data was collected by the Rescue and Relief Organization of IRCS during the years 2012 to 2020 in all Emergency Operation Centers (EOC) of the country. The variables contain the year, the province, the time interval between the occurrence of the disasters and the notification by the RCS aid workers, the time interval between their notification and presence at the scene of the disaster. The median (first and third quartile) after removing the outliers was used to report these times by year and province in the three years of 2012, 2016 and 2020. A line chart was applied to examine the trend changes during the study period.

**FINDINGS:** The results show that the maximum minutes between the occurrence of road accidents and the notification of RCS aid worker was not reported in any province in 2012, and in many provinces, this time are equal to 5 minute. The highest mean minutes were seen 7 in Gilan province and 6 in Zanjan, East Azerbaijan, Fars, Khuzestan and Yazd provinces in 2020. Also, this figure has decreased from 5 in 2012 to 4 minute in 2020 in the country. The highest mean of minutes in 2012 and 2020 belongs to Qom province with 11.5 and 13 minute. The median of these minute has increased from 5 in 2012 to 9 in 2020. In urban accidents, the median time of notification and presence of aid workers at the scene has decreased from 5 to 4 and increased from 5 to 7 minute, respectively. On the other hand, in mountain incidents, a decrease of one minute (from 10 to 9) and an increase from 20 to 36 minute can be seen in the mean of the times of notification of the accident and presence at the scene, respectively.

**CONCLUSION:** According to the type of disasters and the climatic and geographical conditions of the provinces, the duration of disaster relief is different and determining the standard criteria for it depends on various factors. It seems that the time between the occurrence of a natural disaster and the notification and the time between the notification and the presence at the scene in road, urban and mountain incidents are at a favorable level in the RCS.

**Keywords:** Disasters; Red Crescent Society (RCS); Response time; Emergency Operation Center (EOC).

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## Introduction

Coordination is vital to respond and reduce damage and losses when a country is affected by natural disasters such as earthquake, storm, flood, etc. The first 72 hours after the disaster is very important and necessary in order to save human lives so that the fastest and most efficient responses can be made in the initial moments of the event. (1&2) In contemporary societies, the Emergency Medical Service system (EMS) is vital in treatment and care of medical emergencies, and there are many studies on the time of emergency personnel at the scene of accidents. (3) Medical emergencies cause thousands of physical and mental disabilities and

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death and huge economic losses every year. If injured persons or victims are treated in time or within the first 2 to 8 minutes, the mortality rate may be reduced to 40%. However, in this process, quick and timely presence on the scene and providing the required care by emergency personnel is necessary. Failure to consider the time index can increase the rate of death, injuries, complications and dissatisfaction. (4)

Investigation of the causes of the delay in the arrival of the ambulance in incidents and disasters shows that more than 20% of patients who needed emergency treatment died on the way to the hospital due to delays caused by roadblocks and drivers' non-cooperation. (5) In emergency operations, the ambulance response time is divided into 3 categories: short (less than 4 minute), medium (4-8 minute) and long (more than 8 minute). (6) In multi-story buildings, this time will include some additional time. In general, a shorter ambulance response time brings more effectiveness and medical satisfaction. (7)

Mohammadi et al. (2015) in their research found the average time between receiving the mission and arriving at the scene, between arriving and leaving the scene, and between moving from the incident scene to the health center were 7.28, 16.73, and 7.28 minutes, respectively. The overall average performance from the scene to the health center was 11.34 minute. (8) Feizollahzadeh et al. (2022) in their study stated that the average ambulance response time was estimated at 11.58 minute with a standard deviation of 5.69 minute which was relatively long. There is a significant relationship between ambulance response time and technical preparation, traffic conditions, accident time and education level of ambulance personnel. (9)

Jafari et al. (2021) declared the average response time in 640 delayed emergency missions in Mashhad to be 9.01 with a standard deviation of 4.46 minute. In addition, the most frequent cause of delay was related to missions outside the operational range (29.3 %) and the second cause was related to traffic (24.2 %). (10)

Natural disasters from earthquake to hurricane and drought, kill approximately 40,000 to 50,000 people every year, and this number is the average of the last few decades. In 2023, A total of 86,517 people died due to natural disasters, including earthquakes, droughts, storms, floods, forest fires, etc., and trying to minimize the time of providing relief to disaster victims is very important in reducing the number of deaths. (11)

On the other hand, the international standards in providing aid to the injured and reaching the scene of the accident in different countries differ due to the climatic conditions, culture, infrastructure, and the like. There are few scientific articles or documents regarding the duration of relief for the Red Crescent communities by accidents and disasters in Iran and are limited to specific incidents of traffic accidents. (8& 12-14)

According to paragraph 9 of article 29 of the by-laws for the management of transportation safety and traffic accidents approved in 2022, the Ministry of Health and Medical Education and Emergency Organization are obliged to plan for the establishment of a system of providing emergency medical services to accident victims (trauma). In order to achieve the golden time, the average time to reach the victim from the moment of contact on the roads is maximum 15 minute and on secondary and rural roads maximum 20 minute is considered. In this bylaw, the RCS is mentioned as one of the effective organizations and its operational and executive teams are responsible for search, release and rescue and relief in out-of-town roads. According to the report of traffic accidents published by Rescue & Relief Organization of IRCS in the first 4 months of 2019, the average time for RCS rescuers and aid workers to reach the victims of road accidents was 10 minutes and 33 seconds (15) which this number was reported as 13 minutes for Kerman province in 2018. (16) In 2018, the presence of RCS aid workers of Ardabil province at the scene of accidents lasted for an average of 11 minute and 44 seconds, which emphasized on providing timely and quick relief conditions. (17) In



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addition, the average time of providing aid in the month of June 2021 in the country has been announced as 12 minute which this average is estimated due to the dispersion of the rescue & relief bases as well as the difficult access in mountainous and desert areas, and efforts to reduce this time will continue. (18)

In 2024, the report of the RCS of Qazvin province was as follows: the average time of notification of road accidents from the time of occurrence to notification to the RCS of the province is 2 minutes and 57 seconds; the average time of being on the scene of road accident operations from notification to being on the scene is 11 minutes and 10 seconds; the average duration of operations in road accidents from the beginning to the end is one hour and 27 minutes and 19 seconds. (19) Also, in June 2023, the managing director of the RCS of Yazd province announced the registration of 139 rescue operations by the rescuers of the RCS and stated that the current average time of the presence of rescuers of RCS of the province from the time of notification to the arrival at the scene is 13 minutes and 36 seconds and the duration of the operation from the beginning to the end is one hour and 10 minutes and 29 seconds. (20)

In the report presented by the president of the RCS on the occasion of Government Week, one of the results of the actions of the RCS in order to achieve a resilient society, the response time and the presence of aid workers at the scene of traffic accidents between 8 and 9 minutes were announced. (21) In the report of June 2018 regarding reducing the time of rescuers in traffic accidents, the presence time of road and traffic accident rescuers to provide basic and basic rescue services to accident victims was reduced to 9 minutes and 35 seconds. (22)

In general, the number of scientific articles about detailed information about the time of disaster relief in Iran is very rare, and most of the articles are related to the relief time in traffic accidents. However, in order to better respond to natural and man-made disasters and accidents in the disaster-prone country of Iran, which due to climate change, the dimensions and volume of these accidents are increasing day by day, it is necessary to know statistics and accurate information about the time of disaster relief in various accidents and act as a powerful tool to plan and manage incidents as well as possible and save the lives of victims. Therefore, in this research, an attempt was made to take a detailed look at how to respond to incidents by conducting a descriptive study and examining the time of relief in incidents that were served by the RCS.

## Methods

This descriptive-quantitative study is cross-sectional and data was collected by the Rescue and Relief Organization of IRCS during the years 2012 to 2020 in all Emergency Operation Centers (EOC) of the provinces. The variables contain the year, the province, the time interval between the occurrence of the disasters and the notification by the RCS aid workers, the time interval between their notification and presence at the scene of the disaster. The median (first and third quartile) after removing the outliers was used to report these times by year and province in the three years of 2012, 2016 and 2020. A line chart was applied to examine the trend changes during the study period. It is also necessary to explain, the time information of incidents in this research were analyzed with greater frequency and since their information was available for all provinces, it was possible to compare between provinces.

## Findings

The data of the EOC centers of all the provinces of the country shows that due to the completeness of the disaster information including road, urban and mountain accidents of all the provinces and the comparability of the results, it is displayed in this section by province. According to Table 1, the highest median time between the occurrence of road accidents and the notification of RCS aid workers in 2013 was not reported in any particular province and in many provinces this time is equal to 5 minute.

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**Table 1**. Descriptive statistics of the time (minute) between the occurrence of road accidents and the notification of the RCS aid workers by provinces in Iran in 2012, 2016 and 2020

| Province | 2020 | 2016 | 2012 |
|---|---|---|---|
| Alborz | 2 (1, 4/5) | 2 (1, 5) | 3 (1, 5) |
| Ardabil | 5 (3, 6) | 5 (3, 7) | 3 (2, 5) |
| Bushehr | 5 (3, 8) | 3 (2, 5) | 3 (1, 5) |
| Chaharmahal and Bakhtiari | 4 (2, 6) | 5 (3, 10) | 5 (2/25, 9/75) |
| East Azerbaijan | 6 (5, 10) | 5 (3, 10) | 5 (3, 10) |
| Isfahan | 5 (3, 7) | 5 (2, 7) | 3 (2, 5) |
| Fars | 6 (4. 10) | 5 (3. 7) | 5 (3. 6) |
| Gilan | 7 (5, 10) | 5 (3, 5) | 4 (2, 5) |
| Golestan | 2 (1, 2) | 3 (2, 5) | 2 (1, 5) |
| Hamadan | 5 (3, 7) | 4 (2, 5) | 5 (4/25, 10) |
| Hormozgan | 5 (4, 6) | 5 (5, 10) | 5 (5, 10) |
| Ilam | 3 (2, 6) | 2 (1, 3) | 4 (2, 5) |
| Kerman | 2 (2, 4) | 2 (2, 3) | 2 (0, 5) |
| Kermanshah | 3 (2, 4) | 4 (2, 5) | 5 (5, 8) |
| Khorasan Razavi | 4 (2, 6) | 5 (2, 6) | 5 (1, 6) |
| Khuzestan | 6 (4, 10) | 5 (3, 6) | 5 (4, 10) |
| Kohgiluyeh and Boyer-Ahmad | 4 (2, 5) | 4 (2, 5) | 3 (2, 5) |
| Kurdistan | 5 (3, 7) | 6 (5, 10) | 5 (5, 10) |
| Lorestan | 4 (3, 5) | 5 (3, 5) | 5 (5, 5) |
| Markazi | 3 (2, 4) | 3 (2, 5) | 5 (2, 5) |
| Mazandaran | 5 (3, 5) | 3 (2, 5) | 3 (1, 5) |
| North Khorasan | 1 (0, 2) | 2 (1, 3) | 1 (0, 5) |
| Qazvin | 3 (2, 5) | 3 (2, 5) | 3 (1, 5) |
| Qom | 0 (0, 1) | 0 (0, 0) | 1 (0, 3) |
| Semnan | 2 (1, 3) | 1 (1, 1) | 0 (0, 1) |
| Sistan and Baluchistan | 4 (3, 5) | 3 (2, 5) | 5 (4, 10) |
| South Khorasan | 1 (1, 2) | 2 (1, 4) | 3 (1, 5) |
| Tehran | 4 (1, 5) | 4 (1, 5) | 5 (2, 5) |
| West Azerbaijan | 3 (2, 5) | 4 (2, 5) | 2 (1, 5) |
| Yazd | 6 (4, 10) | 5 (3, 8) | 5 (2, 10) |
| Zanjan | 6 (5, 10) | 8 (5, 10) | 5 (5, 5) |
| Kish | ---- | 5/5 (1, 10) | ---- |
| Total | 4 (2, 5) | 3 (2, 5) | 5 (2, 5) |

**Note**: In the above table, the zero values reported for the median indicate the absence of recorded values in the desired city (EOC center of Relief & Rescue Organization).

Table 2 shows that the highest mean time between the notification of road accidents and the arrival of the RCS aid workers in 2013 in the provinces of Qom (11.5 minute), Kurdistan (10 minute) and Sistan and Baluchistan (10 minute). While this mean has increased by 0.13%, 0.10%, and 0.10% in all three provinces in 2020. The highest mean of time between the notification of road accidents until the presence of RCS aid workers was seen in Gilan province (7 minute), and in Zanjan, East Azerbaijan, Fars, Khuzestan and Yazd provinces (6 minute) in 2020. The greatest increase in the time to the RCS aid workers arrival from 2012 to 2020 occurred in Gilan province (75.0%), and in Ardabil, Bushehr, Isfahan and Mazandaran provinces (66.7%). The biggest decrease between 2012 and 2020 was seen in the provinces of Qom (0.100%), South Khorasan (66.7%), Markazi and Kermanshah (0.60%). It should be noted that the mean time between the occurrence of road accidents and the notification by the RCS aid workers was 8 minute in 2016 in Zanjan province. In addition, this time



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has decreased from 5 minute in 2012 to 4 minute in 2020 in the country.

The highest mean time between the notification of road accidents and the arrival of the RCS aid workers were seen in the provinces of Qom (13 minute), Semnan (12 minute), Kurdistan (11 minute) and Sistan and Baluchistan (11 minute), respectively in 2020. The largest increase in the time between the notification of road accidents and the presence of the RCS aid workers from 2012 to 2020 occurred in Semnan province (0.100%), Ardabil (0.100%), Golestan and Ilam (0.100%) respectively, and there was no decrease in the period of time and only the Markazi province had 0% growth. It should be noted that, the mean time between the notification of road accidents and the arrival of RCS aid workers was 13 minute in Qom province in 2016. In addition, these minutes have increased from 5 minute in 2012 to 9 minute in 2020 in the country.

**Table 2**. Descriptive statistics of the time (minute) between the notification of road accidents and presence of the RCS aid workers in the scene in Iran in 2012, 2016 and 2020

| Province | 2012 | 2016 | 2020 |
|---|---|---|---|
| Alborz | 5 (3,10) | 5 (3, 8) | 6 (3, 10) |
| Ardabil | 5 (4, 10) | 7 (4, 11) | 10 (5, 16) |
| Bushehr | 4 (2, 5) | 6 (4, 10) | 7 (5, 10) |
| Chaharmahal and Bakhtiari | 5 (3, 10) | 6 (4, 13) | 9 (5, 15) |
| East Azerbaijan | 5 (4, 10) | 6 (4, 10) | 9 (5, 13) |
| Isfahan | 6 (4, 10) | 8 (5, 12) | 8 (5, 13) |
| Fars | 6 (5, 10) | 7 (5, 12) | 10 (5, 15) |
| Gilan | 5 (3, 7) | 5 (4, 7) | 7 (4, 11) |
| Golestan | 5 (3, 7) | 5 (4, 8) | 10 (6, 14) |
| Hamadan | 6 (4, 10) | 5 (4, 10) | 7 (4, 13) |
| Hormozgan | 8 (5, 12) | 10 (5, 15) | 10 (6, 15) |
| Ilam | 5 (4, 8) | 7 (3, 11) | 10 (6, 17) |
| Kerman | 8 (5, 11) | 10 (7, 15) | 11 (7, 16) |
| Kermanshah | 9 (5, 15) | 7 (5, 12) | 10 (5, 15) |
| Khorasan Razavi | 5 (3, 10) | 7 (5, 12) | 9 (5, 15) |
| Khuzestan | 6 (4, 10) | 7 (4, 11) | 8 (5, 12) |
| Kohgiluyeh and Boyer-Ahmad | 7 (5, 10) | 8 (5, 14) | 8 (5, 13/5) |
| Kurdistan | 10 (5, 15) | 10 (5, 15) | 11 (7, 18) |
| Lorestan | 6 (5, 10) | 6 (3, 10) | 9 (5, 15) |
| Markazi | 6 (5, 10) | 7 (4, 10) | 6 (4, 10) |
| Mazandaran | 5 (3, 9) | 5 (4, 7) | 7 (4, 12) |
| North Khorasan | 5 (4, 9) | 5 (3, 9) | 7 (4, 10) |
| Qazvin | 5 (2, 9) | 5 (4, 9) | 9 (5, 14) |
| Qom | 11/5 (5, 18/25) | 13 (8, 20) | 13 (8, 17) |
| Semnan | 6 (3, 11) | 8 (4, 14) | 12 (5, 18/5) |
| Sistan and Baluchistan | 10 (5, 15) | 8 (5, 14/75) | 11 (6, 20) |
| South Khorasan | 7 (4, 12) | 9 (5, 15) | 10 (5, 16) |
| Tehran | 5 (3, 7) | 5 (3, 10) | 8 (4, 12) |
| West Azerbaijan | 5 (3, 8) | 7 (4, 11) | 9 (5, 14) |
| Yazd | 9 (5, 14) | 9 (5, 13) | 10 (6, 17) |
| Zanjan | 5 (5, 5) | 7 (5, 10) | 8 (5, 13) |
| Kish | ---- | 2 (1, 3) | ---- |
| Total | 5 (4, 10) | 6 (4, 10) | 9 (5, 14) |

Table 3 shows that the highest mean time between the occurrence of urban accidents and the information of the RCS aid workers in 2012 was reported in the provinces of Kermanshah (22 minute), Kurdistan (20 minute) and Khuzestan (10.5 minute), respectively. Meanwhile, in 2019, this mean decreased by 77.3% and 70% respectively in the first two provinces, and there was no change in Khuzestan province. In 2020, the highest mean time between the occurrence of urban accidents and the notification of RCS aid workers was seen in the provinces of Hormozgan (80.5 minute), Yazd (57 minute) and Sistan and Baluchistan (25 minute), respectively. The



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greatest increase in the time between notification of urban incidents and the arrival of RCS aid workers from 2012 to 2020 in Yazd province (1040%), Sistan and Baluchistan (400%) and Ilam (185.7%), as well as the largest decrease in provinces of Qom (100%), Kermanshah (77.3%) and Kurdistan (75%) were seen. It should be noted that the mean time between the occurrence of urban accidents and the notification of RCS aid workers was 15 minute in Hormozgan province in 2016. In addition, these minutes have decreased from 5 minute in 2012 to 4 minute in 2020 in the country. According to Table 4, the highest mean of time between the notification of urban incidents and the arrival of RCS aid workers was reported in Ardabil province (20 minutes) in 2012. While this mean has decreased by 65% in this province in 2020. The highest mean of minutes between the notification of urban incidents and the arrival of the RCS aid workers was seen in the provinces of Yazd (43 minutes), Hormozgan (37 minutes), and Kohgiluyeh and Boyar Ahmad (29 minutes), respectively in 2019, and the largest increase in the time between notification of urban accidents occurred in provinces of Yazd (1333.3%), Qom (1200%) and Ilam (900%) from 2012 to 2020 until the presence of RCS aid workers. The biggest decrease between 2012 to 2020 was seen in the provinces of Kermanshah (66.7%), Ardabil (65%) and Bushehr (33.3%). It should be noted that the mean time between notification of urban incidents and the arrival of RCS aid workers was 25 minutes in Chaharmahal and Bakhtiari province in 2016. In addition, in the country, these minutes have increased from 5 minutes in 2012 to 7 minutes in 2020.

**Table 3**. Descriptive statistics of the time (minute) between the occurrence of urban accidents and the notification of the RCS aid workers in the scene in Iran in 2012, 2016 and 2020

| Province | 2012 | 2016 | 2020 |
|---|---|---|---|
| Alborz | 3/5 (2, 5) | 2 (1, 5) | 3/5 (2, 7/75) |
| Ardabil | 5 (5, 5) | 5 (0/5, 50) | 4 (2, 7) |
| Bushehr | 5 (2, 8) | 3 (2, 8/5) | 3 (2/75, 7/25) |
| Chaharmahal and Bakhtiari | 5 (2, 15) | 11 (5, 30) | 4 (2, 10) |
| East Azerbaijan | 6 (5, 15) | 8 (5, 12) | 5 (3, 10) |
| Isfahan | 4 (2, 5) | 5 (2, 7) | 5 (2, 6) |
| Fars | 5 (2, 10) | 10 (5, 98/25) | 5 (3, 10) |
| Gilan | 5 (1/75, 11) | 6/5 (5, 14/75) | 5 (3, 8) |
| Golestan | 3/5 (0, 6/25) | 5 (1, 7/25) | 2 (2, 4) |
| Hamadan | 8 (5, 16/25) | 5 (2, 10) | 5 (4/5, 11) |
| Hormozgan | 0 (0, 5) | 15 (5, 77/25) | 80/5 (6/5, 994) |
| Ilam | 3/5 (1, 6/25) | 3 (2, 5) | 10 (4/25, 14) |
| Kerman | 5 (2/25, 10) | 3 (2, 4) | 2 (0, 2/25) |
| Kermanshah | 22 (7/25, 63) | 8/5 (3/25, 10) | 5 (5, 10) |
| Khorasan Razavi | 5 (1/5, 10) | 5 (2, 10) | 3 (2, 10) |
| Khuzestan | 10 (4, 16/25) | 5 (3, 9/5) | 10 (5, 18) |
| Kohgiluyeh and Boyer-Ahmad | 3 (2, 5) | 5 (2/25, 9) | 5 (5, 5) |
| Kurdistan | 20 (5, 20) | 9 (5, 40/25) | 5 (5, 13) |
| Lorestan | 5 (2/5, 12/5) | 7/5 (3/5, 10) | 10 (7, 15) |
| Markazi | 5 (1, 7) | 3 (1, 5) | 2 (0/5, 5) |
| Mazandaran | 5 (2, 5) | 3 (2, 5) | 5 (2, 7) |
| North Khorasan | 0 (0, 3) | 3 (0, 6) | 0 (0, 2) |
| Qazvin | 5 (2, 7) | 3 (2, 5) | 4 (2, 5/25) |
| Qom | 1 (0, 3) | 0 (0, 255) | 0 (0, 0) |
| Semnan | 0/5 (0, 2) | 1 (1, 1) | 1 (1, 1) |
| Sistan and Baluchistan | 5 (5, 17) | 8/5 (2/75, 20) | 25 (7/5, 413/75) |
| South Khorasan | 2 (0, 5) | 2 (1, 5) | 1/5 (1, 3) |
| Tehran | 4 (1, 8) | 5 (2, 10) | 5 (2, 5/5) |
| West Azerbaijan | 5 (1/75, 10) | 5 (2/5, 7) | 4 (1, 5/5) |
| Yazd | 5 (2, 10) | 5 (0, 10) | 57 (7, 297) |
| Zanjan | 5 (3, 5) | 5 (5, 10) | 10 (9/25, 14/25) |
| Kish | ---- | 0 (0, 1) | 2 (0, 2) |
| Total | 5 (2, 7) | 5 (2, 7) | 4 (2, 6) |

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**Table 4**. Descriptive statistics of the time (minute) between the notification of urban incidents and the presence of the RCS aid workers at the scene by provinces of Iran in 2012, 2016 and 2020

| Province | 2012 | 2016 | 2020 |
|---|---|---|---|
| Alborz | 8 (4, 10) | 8 (4, 10) | 8 (4, 10) |
| Ardabil | 20 (20, 20) | 20 (20, 20) | 20 (20, 20) |
| Bushehr | 6 (2, 10) | 6 (2, 10) | 6 (2, 10) |
| Chaharmahal and Bakhtiari | 8 (3/5, 17/5) | 8 (3/5, 17/5) | 8 (3/5, 17/5) |
| East Azerbaijan | 5 (0, 10) | 5 (0, 10) | 5 (0, 10) |
| Isfahan | 5 (3, 7) | 5 (3, 7) | 5 (3, 7) |
| Fars | 5 (3, 11/5) | 5 (3, 11/5) | 5 (3, 11/5) |
| Gilan | 5 (3, 11/5) | 5 (3, 11/5) | 5 (3, 11/5) |
| Golestan | 5 (5, 10) | 5 (5, 10) | 5 (5, 10) |
| Hamadan | 5 (4, 10) | 5 (4, 10) | 5 (4, 10) |
| Hormozgan | 0 (0, 15) | 0 (0, 15) | 0 (0, 15) |
| Ilam | 1 (1, 5) | 1 (1, 5) | 1 (1, 5) |
| Kerman | 10 (8/5, 15) | 10 (8/5, 15) | 10 (8/5, 15) |
| Kermanshah | 15 (10, 19) | 15 (10, 19) | 15 (10, 19) |
| Khorasan Razavi | 5 (2, 7) | 5 (2, 7) | 5 (2, 7) |
| Khuzestan | 8 (4/75, 10/5) | 8 (4/75, 10/5) | 8 (4/75, 10/5) |
| Kohgiluyeh and Boyer-Ahmad | 4/5 (3, 10/25) | 4/5 (3, 10/25) | 4/5 (3, 10/25) |
| Kurdistan | 15 (5, 45) | 15 (5, 45) | 15 (5, 45) |
| Lorestan | 10 (1/5, 15) | 10 (1/5, 15) | 10 (1/5, 15) |
| Markazi | 5 (4, 10) | 5 (4, 10) | 5 (4, 10) |
| Mazandaran | 5 (2, 10) | 5 (2, 10) | 5 (2, 10) |
| North Khorasan | 1/5 (0, 4) | 1/5 (0, 4) | 1/5 (0, 4) |
| Qazvin | 5 (2/5, 10) | 5 (2/5, 10) | 5 (2/5, 10) |
| Qom | 2 (0, 5) | 2 (0, 5) | 2 (0, 5) |
| Semnan | 5 (2, 7) | 5 (2, 7) | 5 (2, 7) |
| Sistan and Baluchistan | 10 (8, 27) | 10 (8, 27) | 10 (8, 27) |
| South Khorasan | 4 (3, 6) | 4 (3, 6) | 4 (3, 6) |
| Tehran | 3/5 (1, 5) | 3/5 (1, 5) | 3/5 (1, 5) |
| West Azerbaijan | 5 (1/5, 7) | 5 (1/5, 7) | 5 (1/5, 7) |
| Yazd | 3 (2/75, 5) | 3 (2/75, 5) | 3 (2/75, 5) |
| Zanjan | 15 (5, 17) | 15 (5, 17) | 15 (5, 17) |
| Kish | ---- | ---- | ---- |
| Total | 5 (2, 10) | 5 (2, 10) | 5 (2, 10) |

Table 5 shows that the highest mean minutes between the occurrence of mountains accidents and the notification by the RCS aid workers in Zanjan, Yazd and Chaharmahal and Bakhtiari provinces were 380 minute, 35.5 minute and 28 minute in 2012. While this mean has decreased by 85.9%, 63.4% and 64.3% in all three provinces in 2020. The highest mean of minutes between the occurrence of mountains incidents and the notification by the RCS aid workers were seen in the provinces of Zanjan (53.5 minutes), Khuzestan (18.5 minutes) and Khuzestan, Fars and Hormozgan (17 minutes), respectively in 2020. The greatest increase in the time between the knowledge of the incidents in the mountains and the arrival of the RCS aid workers from 2012 to 2020 occurred in provinces of Qazvin (283.3%), Isfahan (220.0%), and Kohgiluyeh and Boyer Ahmad (150.0%). Also, the biggest decrease between 2012 and 2020 was seen in Qom (90%), Zanjan (85.9%) and Markazi (83.6%) provinces. It should be noted that the mean time between the occurrence of incidents in the mountains and the notification by RCS aid workers was 125 minutes in Hormozgan province in 2016. In addition, these minutes have decreased from 10 minutes in 2012 to 9 minutes in 2020 in the country.

According to Table 6, the highest mean minute between the information about the mountain incidents in and the arrival of RCS aid workers were reported in Semnan (0.48 minute), Markazi (39 minute) and Razavi Khorasan (35 minute), respectively in 2013 while this mean has decreased by 2.1%, 61.5% and increased by 105.7% in all three provinces in 2020. In addition, the highest mean of minute between the notification of the incidents in the mountains and the arrival of the RCS aid workers was seen in the provinces of Hormozgan (0.90 minute), Khorasan Razavi (72 minute) and Khuzestan (58.5 minute) in 2019. The greatest increase in the time between the knowledge of the incidents in the mountains and RCS aid workers' arrival from 2012 to 2020



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occurred in Hormozgan (718.2%), Zanjan (513.3%) and Qazvin (483.3%) provinces respectively. The biggest decrease between 2012 to 2020 was seen in the provinces of Sistan and Baluchistan (69.2%), Markazi (61.5%) and Semnan (2.1%). It should be noted that the mean time between the notification of the incidents in the mountains and the arrival of RCS aid workers was 84.5 minute in Hormozgan province in 2016. In addition, these minutes have increased from 20 minute in 2012 to 36 minute in 2020 in the country.

Table 7 shows the descriptive statistics of the presence of operational forces in 13 types of incidents and disasters during the years 2012 to 2020 in the country. The mean for the presence of RCS aid workers in both 2012 and 2016 for all incidents and disasters is less than or equal to 10 minute. In 2016, it is more than 10 minute for only two incidents of forest and pasture fire and thunder and lightning, and less than 10 minute for other incidents.

Figure 1 shows the trend of the mean attendance time of RCS aid workers at the scene by the type of accident during the years 2012 to 2020 (with the exception of the storm to view a clearer trend of other events). In 2016, this mean has been set to zero due to the lack of accurate information about coastal incidents.

**Table 5**. Descriptive statistics of the time (minute) between the occurrence of incidents in the mountains and the notification of the RCS aid workers at the scene by provinces of Iran in 2012, 2016 and 2020

| Province | 2012 | 2016 | 2020 |
|---|---|---|---|
| Alborz | 8/5 (5, 16/25) | 2 (0, 6) | 3 (2, 5) |
| Ardabil | 10 (5, 120) | 5 (2/5, 13/5) | 10 (5, 24) |
| Bushehr | 6/5 (4, 10/25) | 5 (2, 15) | 11 (4, 30) |
| Chaharmahal and Bakhtiari | 28 (8/75, 127/5) | 27/5 (15, 36/25) | 10 (6, 32) |
| East Azerbaijan | 10 (5, 22/5) | 6 (5, 10) | 10 (6, 16) |
| Isfahan | 5 (0, 15) | 15 (5, 30) | 16 (5, 33/5) |
| Fars | 10 (5, 20) | 15 (5, 35) | 17 (10, 30) |
| Gilan | 15 (9/5, 51) | 13 (5, 43/75) | 16 (10/5, 30) |
| Golestan | 6/5 (2/5, 20/75) | 7 (4, 15/75) | 4 (2, 12) |
| Hamadan | 5 (3/5, 9) | 5 (3/5, 30) | 8 (5, 15/5) |
| Hormozgan | 10 (0, 39) | 125 (10, 400) | 17 (12, 112) |
| Ilam | 14 (5, 20) | 9 (3/25, 19/25) | 10 (5, 20) |
| Kerman | 5 (0, 30) | 3 (2, 5) | 2 (2, 3) |
| Kermanshah | 10 (5, 15) | 8 (5, 12) | 5 (3, 12/5) |
| Khorasan Razavi | 15 (5, 35) | 30 (6/25, 59/5) | 10 (2/25, 25) |
| Khuzestan | 13 (6, 28) | 35 (17/25, 104/25) | 17 (11/5, 31) |
| Kohgiluyeh and Boyer-Ahmad | 6 (2, 12/5) | 15 (9/5, 20/5) | 15 (9, 28) |
| Kurdistan | 15 (10, 32/5) | 5 (3, 27/5) | 12 (6/25, 20) |
| Lorestan | 11 (5, 30) | 15 (6, 20) | 18/5 (8, 30) |
| Markazi | 27/5 (8/75, 90) | 10 (2/25, 30) | 4/5 (3, 12) |
| Mazandaran | 10 (5, 15) | 6 (4, 20) | 11 (5, 25) |
| North Khorasan | 22 (10, 559) | 1 (0, 8/75) | 5 (0, 10) |
| Qazvin | 3 (0, 5) | 4 (2/5, 6) | 11/5 (7/75, 30/5) |
| Qom | 10 (0, 18) | 0 (0, 0) | 0/5 (0, 10) |
| Semnan | 2 (0, 15) | 1 (1, 2) | 4/5 (2, 5/75) |
| Sistan and Baluchistan | 15 (9, 32/5) | 5 (3, 10) | 7 (5, 15) |
| South Khorasan | 5 (1/75, 157) | 30 (3, 400) | 5 (1, 121) |
| Tehran | 5 (2, 10) | 5 (2, 17) | 5 (3, 10) |
| West Azerbaijan | 5 (3, 10) | 10 (5, 30) | 10 (5, 19/75) |
| Yazd | 35/5 (10, 57/75) | 10 (3/5, 24) | 13 (5, 16) |
| Zanjan | 380 (68/75, 908) | 30/5 (6/25, 118/5) | 53/5 (22/5, 143/25) |
| Kish | 10 (4, 15) | 8 (3, 20) | 9 (4, 19) |
| Total | 8/5 (5, 16/25) | 2 (0, 6) | 3 (2, 5) |

**Note**: In the above table, the zero values reported for the median indicate the absence of recorded values in the desired city (EOC center of Relief & Rescue Organization).



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**Table 6**. Descriptive statistics of the time (minute) between the notification of the incidents in the mountains and the presence of the RCS aid workers at the scene by provinces of Iran in 2012, 2016 and 2020

| Province | 2012 | 2016 | 2020 |
|---|---|---|---|
| Alborz | 10 (5, 23) | 14/5 (3/75, 28/5) | 22 (8/25, 43/75) |
| Ardabil | 25 (21/25, 30) | 29/5 (5, 64/25) | 56 (36/5, 105) |
| Bushehr | 10 (4, 15/5) | 32/5 (7, 57/5) | 42/5 (30, 69) |
| Chaharmahal and Bakhtiari | 30 (15, 50) | 30 (18/5, 43/75) | 51 (27, 107) |
| East Azerbaijan | 18 (10, 29/5) | 10 (5, 34) | 25 (13, 65) |
| Isfahan | 12 (5, 25) | 30 (6, 60) | 36 (20, 55) |
| Fars | 17 (10, 29) | 32 (15, 55) | 45 (20, 65) |
| Gilan | 20 (10, 70) | 19 (10/75, 30) | 35 (18/5, 89) |
| Golestan | 15 (10, 30) | 27 (10, 49) | 30 (15, 60) |
| Hamadan | 5 (3/25, 5) | 20 (5, 50) | 26 (9, 60) |
| Hormozgan | 11 (10, 60) | 84/5 (30, 105) | 90 (47, 181) |
| Ilam | 32/5 (10/25, 80/25) | 25 (12, 39) | 50 (35/25, 88) |
| Kerman | 20 (7/5, 30) | 15 (8, 33) | 21 (8, 32/25) |
| Kermanshah | 26 (14/25, 57/5) | 21 (12/25, 34/75) | 30/5 (15, 50) |
| Khorasan Razavi | 35 (16/25, 97/5) | 50 (30, 103/75) | 72 (42, 101/5) |
| Khuzestan | 15 (5, 32) | 30 (20, 40) | 58/5 (31/25, 95/75) |
| Kohgiluyeh and Boyer-Ahmad | 32/5 (14/75, 76/25) | 45 (16, 90) | 47/5 (25, 76/25) |
| Kurdistan | 20 (5, 45) | 25 (2/5, 57/5) | 35/5 (17, 66/75) |
| Lorestan | 30 (14, 40) | 20 (15, 40) | 50 (29/5, 67) |
| Markazi | 39 (7, 60) | 25 (7/75, 40) | 15 (7, 29) |
| Mazandaran | 10 (4, 25) | 13/5 (6, 30) | 36/5 (20, 65) |
| North Khorasan | 14 (5, 40) | 26 (8, 113/75) | 38 (16, 76/5) |
| Qazvin | 6 (3, 12/75) | 20 (5/5, 34/75) | 35 (14, 79/75) |
| Qom | 30 (10, 161) | 39 (25, 70) | 40 (26, 57/5) |
| Semnan | 48 (25, 60) | 29 (11, 44) | 47 (31, 70) |
| Sistan and Baluchistan | 32/5 (16, 100) | 8 (2, 57) | 10 (5, 23/75) |
| South Khorasan | 15 (11, 32) | 30 (10, 52) | 33 (20, 66/5) |
| Tehran | 30 (15, 45) | 15 (5, 40) | 38 (18, 65) |
| West Azerbaijan | 19 (8, 34) | 31/5 (18/5, 60) | 37 (18/5, 62/5) |
| Yazd | 30 (15, 43) | 22 (13, 37/75) | 35 (22/5, 65) |
| Zanjan | 7/5 (5, 43/75) | 32/5 (16/5, 71/25) | 46 (15/5, 85) |
| Kish | 20 (10, 35) | 20 (9, 45) | 36 (18/25, 64) |
| Total | 10 (5, 23) | 14/5 (3/75, 28/5) | 22 (8/25, 43/75) |

**Note**: In the above table, the zero values reported for the median indicate the absence of recorded values in the desired city (EOC center of Relief & Rescue Organization).

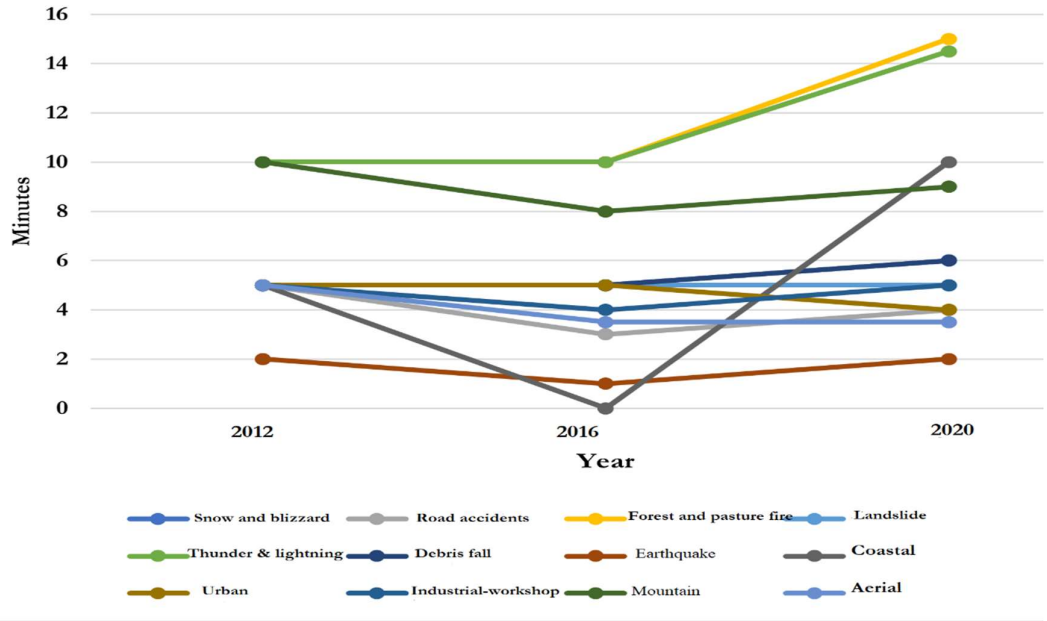



**Figure 1**. Mean of minutes of notification due to the type of incidents and disasters

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**Table 7**. Descriptive statistics of the time (minute) between the occurrence of all the incidents and disasters until notification of the operational RCS aid workers

| Province | 2012 | 2016 | 2020 |
|---|---|---|---|
| Snow and blizzard | 5 (0, 9) | 5 (2, 10) | 6 (3, 15) |
| Storm | 5 (0, 10) | 5 (0/5, 24) | 30 (5, 53) |
| Road accidents | 5 (2, 5) | 3 (2, 5) | 4 (2, 5) |
| Forest and pasture fire | 10 (4, 20) | 10 (5, 25) | 15 (5, 31/5) |
| Landslide | 5 (4, 60) | 5 (5, 12) | 5 (2/25, 17/25) |
| Thunder & lightning | 10 (8, 10) | 10 (1, 6) | 14/5 (3/75, 110) |
| Debris fall | 5 (3, 15) | 5 (3, 15) | 6 (3, 12) |
| Earthquake | 2 (0, 10) | 1 (0, 3) | 2 (0, 4) |
| Coastal | 5 (1, 5) | - | 10 (5, 20) |
| Urban | 5 (2, 7) | 5 (2, 7) | 4 (2, 6) |
| Industrial-workshop | 5 (2, 5) | 4 (2, 5) | 5 (2, 6/25) |
| Mountain | 10 (4, 15) | 8 (3, 20) | 9 (4, 19) |
| Aerial | 5 (1/5, 11/5) | 3/5 (1, 5) | 3/5 (3, 5) |

**Note**: In the above table, the zero values reported for the median indicate the absence of recorded values in the desired city (EOC center of Relief & Rescue Organization).

## Discussion and Conclusion

Natural disasters are usually unpredictable and golden time plays a very important role in relief. For this purpose, relief organizations conduct maneuvers and hard exercises so that they can react as soon as possible after the incident or at the same golden time (23). The loss of golden time in relief causes irreparable damage, therefore, access to a system called *rapid warning* is very important in order for RCS aid workers of Rescue and Relief Organization not to lose this golden time (24). Not many studies have been conducted on the investigation of the time of relief in the IRCS with details such as the type of accident and disaster, province, etc. This study presents a descriptive picture of the time of notification of accidents and disasters and the duration of notification until the presence of RCS aid workers at the scene. The results show the favorable situation of knowing the time of occurrence of accidents in the country so that in urban, road and mountain accidents is less than or equal to 10 minute.

Regarding the time of aid workers presence in disasters to start the rescue and relief operation, it should be said that Iran experiences various natural disasters due to the great variety of weather conditions. Even with quick information about the occurrence, due to the nature of some incidents such as mountains, forest fires, pastures, and landslides, access to the accident scene and the start of rescue operations are faced with some problems and the time for aid workers to arrive is prolonged.

It seems that the time between the occurrence of a natural disaster and the notification and also the time between the notification and aid workers' presence at the scene in road, urban and mountain accidents in the RCS are at a favorable level in the country. However, according to the type of accident, these values fluctuate for different provinces with different climatic and geographical conditions, etc. Therefore, it is strongly recommended to prepare and apply special provincial instructions to reduce the time of relief. In some cases, due to the outlier data (which have been removed as much as possible), there may be fluctuations between the time of notification and attendance during the review period. It is also important to note that in 2012 and the beginning of information registration in the system, the number of bases in the country was 219, while this number reached about 540 bases in 2020. In addition, in 2013, the number of operations was limited and 112 emergency calls were received at the same base, and most of the operations were covered near and around the base. While in the following years, especially 2020, when the operations and bases expanded, the distance between the accident site and the base is 30 to 50 kilometers. Therefore, the mentioned factors are effective in increasing the mean time in 2020 compared to 2012 in some



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cases and should not be ignored in possible conclusions and analyses.

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## Conflict of Interests

The authors declare no conflict of interest.

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