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# Assessing the Efficiency of Muster Point in Crisis: A Case Study in Tehran City

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## Abstract

**Background**: One of the most important factors in crisis management is the location of a muster point to reduce vulnerability. This study aimed to assess the efficacy of designated sites for muster point during a crisis in one of the districts of Tehran. **Methods**: This study was conducted in a cross-sectional descriptive-analytic study in 2018 using a researcher-made questionnaire. The assessed areas in this study included (1) the adequacy of the number of muster points, (2) parameters affecting muster points, (3) the use of the GIS in crisis management, (4) solutions affecting the reduction of damages, (5) attention to safety of muster points and (6) crisis management. The data were analyzed using SPSS version 22 and independent t-test. Significance level was considered as 0.05. **Results**: 80 crisis management experts participated in this study (63 males and 17 females). The mean age and experience of the participants were less than 40 and 15 years. The results of assessing the effeciency of the muster points in 6 studied areas showed that the highest value was related to the use of the GIS in crisis management 3.88(0.65), effective parameters on muster points 3.78(0.75) and the safety of the muster points 3.74(0.69). In addition, the analytical findings showed a significant difference with the criterion value ($p$<0.001). **Conclusion**: The findings of this study indicated that the studied muster points were sufficient and determined based on population density and geographical information system parameters. In addition, these results can be used as a basis for macro managerial decisions.

**Key words**: Crisis management; muster point; Tehran; efficiency assessment

## Introduction

The vulnerability of urban areas, especially in big cities is always assessed high due to human and building density, construction of unresistent buildings against natural disasters such as flood and earthquake, establishing buildings on unstable lands and slopes, on faults and flood paths, and the lack of proportionality in land uses. The lack of attention to the appropriate location of settlements, the growth and development of established settlements, as well as the lack of required planning for preventing the unprecedented growth of such settlements caused many problems for the safety of settlements and crisis management.[1] These problems indicate the weakness of planning and the inappropriate use of management in the use of new methods and plans with high efficiency to deal with natural disasters. In fact, it seems that there is no

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integrated and known approach in this regard. Thus, planning for crisis management due to natural disasters and developing integrated models by considering known theoretical approaches is essential and can be significantly effective on the performance of crisis management.[2, 3]

As a result, researchers conducted extensive applied research in optimizing safety, increasing design innovations, and finding the best and most cost-effective methods and technologies. In addition, experts believe that because of the lack of coordination and required protocols in this field in governmental and nongovernmental relief organizations in developing countries, managerial decisions and planning are made without the use of the information in this area which is considered as the casue of delay in growth and development. [4-6] Thus, crisis management should be one of the priorities of the development planning system in developing countries and in this regard, integrated management is of significance for reducing the effect of accidents and vulnerability. In fact, a country can deal with crises caused by natural disasters when it has an efficient and integrated management and structures and organizations manage the potential urban crises by interacting and cooperating with each other .[7, 8] One of the very important factors in the area of crisis management is access status, fair distribution of public resources, and the location of uses at the level of city such as muster points and fire stations at the time of crisis. [9, 10] Thus, this study aimed to assess the efficacy of muster points at the time of crisis including the study of the quantity of muster points and the assessment of muster points based on population density.

## Methods

The present study was a cross-sectional descriptive-analytical study which was designed and conducted in 2018 with applied purposes. The spatial scope of this study was one of the 22 districts of Tehran. The statistcial population included the educated and experienced professionals and experts in the field of urban crisis management including urban crisis management experts, firefighters, university professors, and researchers of urban crisis management. Due to the dispersion of the studied population, the sampling method was census. The number of participants in this study was 80 (63 males and 17 females). The research data were collected by field method (distributing a questionnaire among the respondents). The main research tool was a researcher-made questionnaire which was designed based on literature review and consultation with crisis management experts. The content validity of the questionnaire was confirmed at three steps based on the opinion of 20 experts in crisis management and the reliability of this questionaiore was confirmed by Cronbach's alpha coefficient as 0.86.

This questionnaire was completed in two parts of demographic information and assessing the efficieny of muster points. The part of assessing the efficieny of muster points included 35 questions being completed on a Likert scale (very low (code 1), low (code 2), average (code 3), high (code 4) and very high (code 5)). The evaluated areas in this part included the adequacy of muster points (3 questions), the parameters affecting muster points (7 questions), the use of the GIS in crisis management (7 questions), soluitions affecting the reduction of damage (8 questions), attention to the safety of muster points (5 questions) and crisis management (5 questions). Data analysis was conducted using descriptive and analytical statistical tests in SPSS software version 22. Significance level in this study was considered as 0.05.

## Results

The results about the personal and demographic variables of the participants, including mean age, work experience, marital status, and education are presented in Table 1. As can be observed, the mean age and work experience of the participants were respectively under 40 and 15 years. 75% of the participants were married and they all had a bachelor's degree and higher. In addition, their area of work and expertise of 0.45% of them was crisis management personnel and 0.50% of them were fire station personnel. The descriptive and analytical results related to the assessing of the efficiency of muster points based on the six areas are presented in Table 2. As can be obserevd, the highest obtained values were related to the use of the GIS in crisis management 3.88 (0.65), the parameters affecting muster points 3.78(0.75) and attention to muster points 3.0 (74.69). In addition, the analyrtical findings based on one-sample t-test for assessing the efficacy of muster points based on a Test Value equal to 3 indicated a significant difference with

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the criterion value in terms of the studied six areas ($P$ <0.001). It should be noted that the criterion value in this study was estimated through the calculation of mean for the areas of assessing of the efficiency of muster points.

Table 1. Personal and demographic variables of the studied participants

| Variable | | Male (63) | Female (17) |
|---|---|---|---|
| Age (year) | | 38.05±5.12 | 34.12±6.28 |
| Work experience (year) | | 13.60±3.72 | 11.53±4.90 |
| marital status(%) | Single | 13(20.60) | 7(41.20) |
| | Married | 50(79.40) | 10(58.80) |
| Education(%) | bachelor's | 22(34.90) | 9(52.90) |
| | Master's | 33(52.40) | 6(35.30) |
| | Phd | 8(12.70) | 2(11.80) |
| Field of expertise (%) | Crisis management | 22(34.90) | 14(82.40) |
| | Firefighter | 38(60.30) | 2(11.70) |
| | Urban management and urbanism | 3(4.80) | 1(5.90) |

Table 2. Assesing theb efficeicny of msuter points

| Studied areas | Mean (SD) | t | Degrees of freedom | Significance level |
|---|---|---|---|---|
| Adequacy of muster points | 3.45(0.42) | 10.05 | 79 | <0.001 |
| Parameters affecting muster points | 3.78(0.75) | 9.27 | 79 | <0.001 |
| Use of the GIS in crisis management | 3.88(0.65) | 11.99 | 79 | <0.001 |
| Solutions affecting the reduction of damages | 3.53(0.62) | 7.63 | 79 | <0.001 |
| attention to the safety of muster points | 3.74(0.69) | 8.80 | 79 | <0.001 |
| Crisis management | 3.56(0.74) | 8.24 | 79 | <0.001 |

Significance level: $P$<0.05

## Disscussion and conclusion

One of the critical issues that human societies face at the time of natural disasters and accidents is the vulnerability of urban areas. The growth of big cities has led to the too much density of activities, assets, facilities, resources, and vulnerability of human beings. Thus, some plans such as prevention, preparation, coping, and settlement are required to reduce damages and manage the crisis. Meanwhile, damages have been significantly reduced in communities with disaster preparation plans . [11-13] In general, the results of the present study, which was conducted to assess the efficacy of muster points at the time of a crisis based on a case study in one of the districts of Tehran showed that the efficiency of muster points in the studied area was based on the six areas of the adequacy of the number of muster points, the parameters affecting muster points, the use of the GIS in crisis management, the strategies affecting the reduciton of damages, attention to the safety of muster points and crisis management were assessed asn positive and above the desired average. Among the factors which significantly affect the safety and quality of life in cities are paying attention to crisis management and crisis management strategies. [7, 14, 15]

The size of muster points is one of the key factors at critical times. If the muster point is sufficient at the time of crisis, the mortality will be reduced. Thus, the number of muster points is one of the requirements which should be considered for crisis management. If the number of muster points is sufficient, it will lead to the reduction of casualties.[16] The analytical results of assessing the adequacy of the number of muster points indicated that the number of designated locations for muster points was significantly higher than the specified criterion values. Thus, the adequacy of the number of muster points at the time of crisis is assessed as good and appropriate. Cities are subject to different degrees of vulnerability at the time of crisis in terms of their population density. The main reason is that population concentration makes evacuation difficult at the time of predicting natural disasters. The high density of buildings in Tehran in many urban areas significantly reduced open urban spaces which, at the time of a crisis, eliminates traffic congestion due to excessive debris on communication routes. As a result, the risk of vulnerability will increase making relief face a lot of problems. Since considering muster points in terms of the number of residents in the city is of great importance. If the muster point is considered based on population density, it can help with the reduction of casualties and damages. Thus, it can be said that muster points based on population density is very important. [17] The analytical findings of assessing the parameters affecting muster points such as population density showed a significant relationship between the presented muster points and parameters such as available population density. Thus, it can be stated that muster points are identified based on parameters such as population density. Timely information is the most critical part of any successful management plan. In the process of information crisis,

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information is seriously at risk. The GIS enables quick access to information at the time of crisis and plays an important role in reducing casualties and damages. If the GIS is used at the time of crisis, it can help show the to ways of access to muster points.[18, 19]

The findings of assessing the use of the GIS in crisis management and designating muster points in this study showed that the use of the GIS was significantly high for designating muster points. In addition, muster points are very important for promoting the potentials of coping and preparation of urban areas before, during, and after a crisis. Thus, paying attention to the safety of these places in the urban planning process is of great interest. Tehrefore, regarding the safety of muster points can promote effective crisis management and reduce financial losses and casualties.[20] It should be noted that every study has some limitations which make it difficult to generalize the results. The present study was no exception and had some limitations such as the novelty of this study, the lack of information sources for comparison, the use of past experiences, non-consideration of all strengths and weaknesses due to cross-sectional nature of the study, and the lack of cooperation to have access to some required data for the study. Thus, the present study whichaimed at assessing the efficiency of muster points at the time of a crisis in one of the dsitricts of Tehran can be used as a basis for managerial and macro decision-making in other disctrist of Tehran. Based on the obtained results, it can be stated that there are adequate muster points for the time of crisis in the studied urban area. On the other hand, muster points wereidentified based on parameters such as population density and the basis for determining such points was the use of the GIS.

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