Disaster Medicine and Public Health Preparedness

www.cambridge.org/dmp

Report from the Field

Cite this article: Sarani M, Safi-Keykaleh M, Safarpour H, Honarvar MR, Kalteh E, Jahangiri K (2022) Tractor ambulance: an initiative of emergency medical services response to the flood of Golestan, Iran in 2019. *Disaster Med Public Health Prep* **16**: 1695–1697. doi: https://doi.org/10.1017/dmp.2021.22.

First published online: 5 May 2021

Keywords:
disaster; emergency; flood; ambulance; innovation; prehospital

Corresponding author:
Katayoun Jahangiri,
Email: k.jahangiri@sbmu.ac.ir.

Tractor Ambulance: An Initiative of Emergency Medical Services Response to the Flood of Golestan, Iran in 2019

Moslem Sarani[1,2], Meysam Safi-Keykaleh[3], Hamid Safarpour[4], Mohammad Reza Honarvar[2], Ehsan Kalteh[2] and Katayoun Jahangiri[1,5]

[1]Department of Health in Disasters and Emergencies, School of Public Health and Safety, Shahid Beheshti University of Medical Sciences, Tehran, Iran; [2]Health Management and Social Development Research Center, Golestan University of medical sciences, Gorgan, Iran; [3]Malayer School of Nursing, Hamedan University of Medical Sciences, Hamedan, Iran; [4]Department of Nursing, Faculty of Nursing and Midwifery, Ilam University of Medical Sciences, Ilam, Iran and [5]Safety Promotion and Injury Prevention Research Center, Shahid Beheshti University of Medical Sciences, Tehran, Iran

Abstract

Heavy rains in March 2019 led to severe floods in large parts of Iran, with severe financial and physical casualties (in the Golestan province, 11 districts were trapped in water). An increase in the EMS missions while serving a big portion of the needed population was a big problem for the health system during the flood; Therefore, a new solution was needed to overcome this problem. Using a farm tractor for transporting the patients and injured people was the first relief experience ever documented in the whole country. In the present report, despite the limitations and challenges, the tractor has been shown to be a proper and effective disaster relief vehicle. This report could help other similar countries face disasters, especially floods.

Introduction

Floods with the highest incidence of largely affected populations and economic losses are by far more important compared to other natural disasters.[1] Iran, with 90% of its population at risk of floods is a flood-prone country.[2,3] In the year 2019, devastating floods in Iran had 200 cities and 4300 villages affected, 80 dead and 1136 injured.[4] Golestan province, having repeatedly faced the consequences of floods such as death, injury and the spread of food-related illnesses, is 1 of the most flood-prone provinces of Iran.[5] Due to the morbidity and mortality following the flood, the pre-hospital emergency system as a gateway to health-system services is required to provide timely services to the injured and patients.[6] These services are usually provided by ground ambulances including cars, buses, motorbikes, boats, and sometimes air aid using helicopters and aircraft,[7] which often face problems serving their duties due to disasters, exposure to casualties, and limited resources. Therefore, the efficient and effective use of the minimum available supplies and alternative resources play an important role in providing pre-hospital services, as well as reducing mortality and morbidity.[8] In many disasters, especially floods, the use of Heavy-duty and assisted vehicles is inevitable in the management of the scene.[9] Therefore, this study was conducted to provide a report of tractor ambulance (Tractorlance) services in the Golestan province flood in March 2019.

Narrative

Heavy rains in March, 2019 led to severe floods in large parts of Iran, with severe financial and casualties' consequences. Affected by the floods were 200 cities and 4304 villages, which resulted in 3285 injured, including 1411 people transferred to medical centers and 1874 treated on the scene.

In Golestan province, which is adjacent to the Caspian Sea (north of Iran), precipitation occurred over an area of 8500 square kilometers (about 40% of the total area of the Golestan province). Of the districts under the Golestan province, 11 were trapped in water. Affected areas were approximately 170 kilometers long and 50 kilometers wide with a population of over 695000 inhabitants. The cities of Gonbad-Kavous, Anbar Alum, Aq Qala and Simin-Shahr (Gomishan Basin) were within the direct impact of the flood. While the cities of Gomishan, Aq-Qala, Kordkoye, Turkmen, and Gonbad-Kavous were surrounded the most, the cities of Aq Qala and Gonbad received more damage and loss due to their terrain (soil slope) and their geographic location.[10] Since more than 40% of the Gomishan city was trapped in the flood and linking roads were damaged, it was difficult to provide Emergency Medical Services (EMS).

© Society for Disaster Medicine and Public Health, Inc. 2021.

Figure 1. EMS personnel are transporting the patients with tractor ambulance in the flooded area.

Table 1. The statistics of the missions carried out from 3/20/2019 to 4/3/2019

Items	Number
On-site treatment and tractor transmission	55
Transported by ambulance helicopter	22
Land dispatch	171
Pregnant mother transfer	29
Total number of missions	248

Table 2. The total number of patients transported with tractor in the Golestan floods 2019

Age group	Number
Children up to 12 years	5
12-18 years	3
18-45 years	6
45-60 years	13
Seniors 60 years and over	4
Pregnant mother	3
Total	34

Discussion

An increase in EMS missions coupled with the pressure of serving a big portion of the needed population was a big problem for the health system during floods because in normal missions, they were served by 2 emergency medical technicians in an ambulance, but in disastrous conditions where a lack of linked safe-roads missions prevailed, serving capacity was increased to 8 ambulances with 16 technicians (in a small city, not in the whole province). In addition, these conditions were only available on land, and in the case of flooding, they would have to service the boat or the back of the tractor and deliver the injured and the patients 6 km away to a safe place by ambulance, helicopter or ambulance bus. Another challenge was that although more than 30% of the missions were carried out by tractors, these missions were registered only in the name of the ambulance, so there are no exact statistics on the number of missions performed by the vehicle (Table 1).

Therefore, a new solution was needed to overcome this problem. Using a farm tractor for transporting the patients and injured people was the first relief experience ever documented in the whole country and it was done in Gomishan city. Since the area was flooded to a height of 130cm, and normal ambulances were not able to operate in the mud, the tractor helped carry in people from the flooded site to the ambulance site. The tractor was equipped with a metal chamber on hydraulic arms on its back to transport

https://doi.org/10.1017/dmp.2021.22 Published online by Cambridge University Press

the patients to a safe place and it was used for 24 hours in 3 shifts (Figure 1). The patients transported by the ambulance tractor were 34 in number (Table 2).

Conclusion

Due to sanctions and financial instability in developing countries such as Iran, there is a short supply of ambulances on roads and remote routes following disaster, the tractor can be used as a high-capacity relief device. In the present report, despite the limitations and challenges, the tractor has been shown to be a proper and effective disaster relief vehicle. Community-based initiatives and enhancing local capacity in countries like Iran are a rational way to enhance health system proficiency and service efficacy. Training and employing native workers to use the local vehicle like a tractor can improve the effectiveness of emergency medical services in disaster situations; it can partially reduce the limitations of pre-hospital emergency resources and provide a timely and effective response to disasters.

References

1. **Guha-Sapir D, Hargitt D, Hoyois P.** *Thirty years of natural disasters 1974-2003: The numbers*. Brussels, Belgium:Louvain-La-Neuve; 2004.
2. **Khankeh HR, Khorasani-Zavareh D, Johanson E, Mohammadi R, Ahmadi F, Mohammadi R.** Disaster health-related challenges and requirements: A grounded theory study in Iran. *Prehosp Disaster Med.* 2011;26(3):151–158.
3. **Babaie J, Noori M, Sarani M, Sadeghi F.** flash flooding in east Azerbaijan province, Iran: A field report. *Health in Emergencies and Disasters.* 2019;4(2):109–111.
4. **Report SDfNF**. *The 2019 Iran Floods Narrative, Special Reporting Committee on Iran Floods 2019.* Iran. 2019. https://nfr.ut.ac.ir/en. Accessed March 23, 2021.
5. **Ardalan A, Holakouie Naieni K, Kabir MJ, *et al.*** Evaluation of Golestan province's early warning system for flash floods, Iran, 2006-7. *Int J Biometeorol.* 2009;53(3):247–254.
6. Centers for Disease Control and Prevention (CDC). Public health consequences of a flood disaster in Iowa, 1993. *MMWR Morb Mortal Wkly Rep*. 1993;42(34):653–656.
7. **Stewart RD, Brennan J, Krohmer J.** History of EMS: foundations of a system. *Principles of EMS Systems.* 3rd ed. Sudberry, MA: Jones and Bartlett Publishers; 2006:2–15.
8. **Wang HE, Yealy DM.** Emergency medical services system research: Challenges and opportunity. *Ann Emerg Med.* 2007;50(6):643–644.
9. **Caporale SJ, Cergneux M, Freed W, Matzal AL.** The development of a prototype for an automated ambulance dispatch system in Venice, Italy. 1997. http://www.veniceprojectcenter.org/vpc/project/development-of-a-prototype-for-an-automated-ambulance-dispatch-system-in-venice-italy.
10. **Beitollahi A**. Golestan Flood report. Hazard Working Group Report. Ministry of Roads and Building; 2019.

https://doi.org/10.1017/dmp.2021.22 Published online by Cambridge University Press