

Overview of the Strengths and Challenges Associated with Healthcare Service Rendered in the First 10 Days after the Great Flood in Northern Iran, 2019

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Abstract

Background: Iran is a disaster-prone country, and many flood events occur in its provinces annually. The unprecedented amount of rainfall in the northern region of Iran (from March 17 to 22, 2019) led to flash flooding of the Golestan Province.

Objectives: This study assessed the challenges and strengths of health-related needs in the first 10 days after the great flood in Golestan; via interviews with experts.

Methods: This cross-sectional and qualitative study was carried out in Gonbad-e-Kavoos, Anbar Alum, Aq-Qala, Simin Shahr, and Gomishan cities of the flood-hit province of Golestan from March 21, to April 13 in 2019. The data were collected using the researcher's field observations and interviews with 26 experts and policymakers.

Results: The findings were categorized into 10 main groups namely mental health, environmental health, health education, maternal, infant, and child health, nutrition, epidemics, drugs, mobile hospitals, non-communicable diseases, and management. Environmental health issues were faced with a wide range of challenges.

Conclusion: Due to the insufficient development of many health infrastructures in underdeveloped and developing countries, health policymakers and disaster management experts should collaborate before and after the disaster to detect and resolve the flaws. This could help reduce health problems and challenges when a natural disaster occurs, particularly by diminishing the number of morbidities and mortalities.

Keywords: Challenge, Health, Flood, Golestan, Iran.

Introduction

Flood is referred to an increased flow of any body of water for natural or artificial reasons.¹ Flood is the most common type of natural disaster in the world.² Due to climate change and manmade manipulation in nature, these events are increasing in the world.³ Increasing urbanization might also pose people the risk of flooding.⁴ Floods in developing countries have increased the burden of diseases and mortality and imposed huge losses on infrastructures.⁵ The health consequences of floods depend on geographic and socioeconomic factors as well as on the vulnerability of the population.⁴ Various studies have shown that after a flood, various factors such as female gender,⁶ old age,⁷ and traumatic events⁸ can have negative impacts on the individuals' health.

The health consequences of floods can be categorized into immediate-, medium-, and long-term effects. Immediate effects include injuries, drowning, and outbreaks of gastrointestinal diseases.⁹ Medium-term effects include complex injuries, infectious ulcers, and contagious diseases. Finally, long-term effects include chronic diseases, such as mental disorders and malnutrition.⁴ Lack of food supplies and safe water can also exacerbate the situation. Epidemic diseases, such as dengue fever, diarrhea, and snakebite have appeared after flood events.¹⁰ Moreover, evidence has shown that flooding influences all aspects of the psychological lives of the affected individuals in the short and long run.¹¹ Psychological disorders, such as stress, depression, anxiety, emotional stresses, suicide attempt, and Posttraumatic Stress Disorder (PTSD) rise after a flood.¹²⁻¹⁵ Various studies have

reported that there is a considerable increase in respiratory problems like flu, headaches, shock, skin rashes, hypertension, physical injuries, ear, nose, and throat infections, stomach pain, and cough after the flood.¹⁶

Iran is a disaster-prone country, and many flood events occur in its different provinces annually. Golestan province has 14 cities with a population of 1,868,819 people.¹⁷ This province borders the Caspian Sea and is a flood-prone region where Gorgan Rood and Ghare Sou rivers are flooded by heavy rains flooding the surrounding areas. The unique geographical status of the province and is close to the Caspian Sea have considerably increased the potential for floods in this area. Statistics have indicated that several destructive floods occurred in the province. The amount and intensity of precipitation, land topography and soil type are the main causes of flood events in Golestan province.

The unprecedented rainfalls in the north of Iran (from March 17 to 22, 2019) led to the occurrence of a flash flood in Golestan province. The province has two major rivers called Gorgan Rood and Ghare Sou. With continuous rainfalls during the final days of March 2019, runoff water with a very high discharge encompassed the northeast of Gonbad city, passed through the eastern dams of Gonbad (Golestan and Bustan), and finally formed a huge flood in a vast area of the region. This event occurred to the population along with the Gorgan Rood to the eastern fringe of the Caspian Sea (Aq-Qala, Simin Shahr, and Gomishan), which led to flooding and evacuation of the cities and villages in the vicinity of Gorgan Rood. The area affected by direct flooding in Gonbad-e-Kavoos, Anbar Alum, Aq-Qala, Simin Shahr, and Gomishan cities had a population of about 211,000 people. Nearly, 57,000 houses in the urban and rural areas were affected by the flood and 67 villages were seriously damaged. Golestan flash flood rainfall was 122 times more than the average value over the past 50 years. This flood led to the death of nine people directly and indirectly and affected almost 399,153 people. The urban and rural infrastructures also experienced huge damages. About 8,000 people were housed immediately in 51 camps, and some flood victims were relocated to safer areas via boats and helicopters.

Objectives

This study aimed to investigate the challenges and strengths of health-related needs in the first 10 days after the great flash flood in the north of Iran by direct field observations and interviewing experts. Therefore, the results of this study can be used as a valuable experience in future floods.

Materials and Methods

This cross-sectional and qualitative study was carried out in the flood-hit province of Golestan from the 1st of March

until the 13th of April 2019. The data were collected using the researcher's observations and deep interviews with 24 experts and policymakers. Given that three of the researchers were disaster health professionals, a part of the data was collected by the researchers through field observations.

Participants

The inclusion criteria for experts were: 1) having minimum job tenure of two years and 2) having at least an undergraduate degree. The exclusion criteria were 1) physical and mental unpreparedness to participate in the study and 2) unwillingness to cooperate in the study. Sampling was performed using purposive and snowball methods, where each expert introduced the next expert. Eventually, 26 experts were interviewed. The number and demographic characteristics of the interviewed experts are presented in (Table-1).

Data collection

Deep and semi-structured interviews were conducted by asking the experts about their challenges, weaknesses, strengths, and requirements. The following questions were asked: 1) What are the health-related challenges and problems in the flooded areas, 2) What are the strengths in service provision to flood-affected areas, and 3) What are the health-related needs of flood-stricken people. Probing questions were also asked based on the responses provided by the participants. The interviews lasted for 30-120 minutes. The interviews were conducted in a quiet room and ended with data saturation.

Data analysis

The collected data was transcribed to extract its strengths and challenges followed by manual thematic analysis. This analysis consisted of six steps: a) getting familiar with the data, b) creating primary codes, c) searching for classes and subclasses, d) reviewing the classes and subclasses, e) defining and naming the classes and subcategories, and f) reporting.¹⁸ For this reason, a total of 210 codes were extracted after analysis of the transcriptions, which were categorized into 10 groups by removing and re-analyzing the repetitive codes.

Rigor

The Guba and Lincoln criteria¹⁹ were applied to ensure the accuracy and precision of the qualitative data and to examine the trustworthiness, transformability, dependability, and conformability.

Ethical considerations

Ethical considerations included 1) observing the confidentiality of personal information, 2) delivering the research information to the participants, 3) obtaining written informed consents from the experts, 4) acknowledging all contributors, and 5) obtaining permission from the local Ethics Committee.

Table-1. The experts participating in the study

N	Specialist	No.	Mean age (year)	Gender		Education				
				Male	Female	Bachelor's	Master's	PhD	MD	Medical Specialist
1	Environmental Health	2	41.5	2	0	0	2	0	0	0
2	Psychologist	3	34.3	2	1	1	2	0	0	0
3	Nutritionist	2	38.3	0	2	1	1	0	0	0
4	General practitioner	7	47.5	3	4	0	0	0	7	0
5	Contagious diseases	2	40.5	0	2	1	0	0	0	1
6	Health in disasters and emergencies	3	48.5	3	0	0	0	2	0	1
7	Midwife	3	39	0	3	0	3	0	0	0
8	Pharmacist	2	36.2	0	2	0	0	0	2	0
9	Epidemiologist	1	32	0	1	0	1	0	0	0
10	Health Management Services	1	51	0	1	0	0	1	0	0
Total		26	40.88	10	16	3	9	3	9	2

Results

The findings of this study were categorized into 10 major groups including mental health, environmental health, health training, maternal, infant, and child health, nutrition, contagious diseases, drugs, field hospitals, non-communicable diseases, and management. The challenges and strengths of each category are discussed below.

Mental health

Strengths: The presence of psychologists, welfare staff, and educational counselors from the first days, identification and screening of high-risk individuals using Acute Stress Disorder (ASD) questionnaire, referral to a psychiatrist, referral for methadone, providing psychological services, organizing game therapy sessions for children, distributing child support equipment such as toys, and holding empathy meetings for adults.

Challenges: There were various disorders, such as depression, severe anxiety, suicidal thoughts, and scarce drug abuse. The healthcare workers suffered from physical, emotional, and mental burnout. Also, there were shortages of toys for children.

One of the experts said: "The children had sleep deprivation so that we held game therapy sessions with the coordination of the university's health department and gave them some toys".

Environmental health

Strengths: Colorimetric tests, monitoring water distribution from the source and distribution centers, regular daily visits from the campus kitchen and distribution stations, organoleptic control of food, vector control, regular

inspection of sanitary facilities and baths, training people regarding environmental health, sanitization with perchloride, lime, and acrylamide, suitable cooperation with the Water and Wastewater Organization of the province, spraying waterlogged sites with disinfectants and gasoline, control and elimination of animals' dead bodies, waste landfill monitoring, the active presence of environmental health personnel in the camps and flooded areas, advising the entire people of the flooded areas about boiling drinking water, employing environmental health students for training families in the camps, adding toilets and bathhouses, and establishing septic wells.

Challenges: Damage to urban and rural water supply networks, creation of sewage in the area, urban sewage leakage into waterlogged sites, and presence of a large number of insects in the area.

One of the experts said: "The most important component of the response to disasters, particularly floods, is environmental health; contagious diseases will increase if the environment is not safe. We trained health issues, such as boiling water, to the people and provided them with environmental health pamphlets".

Health education

Strengths: Needs assessment in the camps, installation of training banners, distribution of tracts and training pamphlets (prevention of lice, scabies, waterborne and foodborne intestinal diseases, and snakebite and paying attention to safety tips for returning home), broadcasting audio messages via radio, and holding individual and group training sessions. No challenges were observed in this category.

The health status of mothers, infants, and children

Strengths: Vaccination of children, provision of women's health needs, census of pregnant women and infants as well as quickly resettling them in special camps, quickly sending high-risk mothers to Gorgan using helicopters, and having midwives at campsites.

Challenges: Lack of equipment such as abaisse-langue, sonic aid, and blood pressure measurement instrument, difficulty in identifying the target groups, and security problems in the camps.

Nutrition

Strengths: Fast nutrition assessment, quantitative and qualitative monitoring of food basket, and designing and implementation of nutritional interventions.

Challenges: Lack of supplements for children, lack of vitamins A + D and multivitamins for children, lack of adequate iron supplements for pregnant women, lack of vitamin A (25,000 mega-dose), inaccessibility to grains, milk, dairy products, and fruits, failure to supply special food for chronically ill patients (e.g. diabetes and hypertension), lack of appetite in children, and not considering the regional food culture.

Contagious diseases

Strengths: The presence of trained physicians, sampling of suspicious cases to communicable diseases, especially diarrhea, paying attention and regular monitoring of measles, influenza screening, immediate reporting, syndromic screening, polio and MMR vaccinations for children aged under 15 years, rabies vaccinations for animal-bites, regular and accurate monitoring of outbreaks, cholera screening, and control, distribution of permethrin and lindane shampoos for pediculosis control, drugs to prevent scabies, and serum supply for snake and scorpion bites. Indeed, various tests such as *Vibrio cholera*, *Salmonella*, *Shigella*, and *E. coli* 0157 were performed. Moreover, the rectal swab test showed no positive results.

Challenges: Outbreaks of infectious and dermatological diseases.

Drug

Strengths: Presence of pharmacists in the camps and refrigerator for storing cold-chain drugs.

Challenges: Acetaminophen, cephalexin, azithromycin, amoxicillin, ibuprofen, aspirin 80, captopril 50, omeprazole, atorvastatin, and estrone, metoprolol 50, loperamide, hyoscine, dimitron, and chloramphenicol eye drop were much more frequently used. There was a lack of serums, antibiotics, medication for scabies treatment, insulin, normal saline, dextrose, Ringer's lactate, and drugs for organ transplant and chemotherapy. Some other challenges included the lack of verification regarding drug distribution to the public,

shortage of drug transport vehicles (boats and helicopters), and coordination with insurance firms.

Field hospital

Strengths: Triage at the hospital, on-call health staff, presence of specialist physicians in the area, consideration of support staff, provision of appropriate medication, availability of adequate equipment and medication, and written referral of patients to other hospitals.

Challenges: Lack of coordination regarding the dispatch of specialist physicians to flood-hit areas, excessive free healthcare services, dispatching uncoordinated healthcare personnel, and lack of visiting time control.

Non-contagious diseases

Strengths: Screening hypertension, hypothyroidism, diabetes, and Phenylketonuria (PKU).

Challenges: Lack of drugs for special diseases such as organ transplants and chemotherapy.

Management

Strengths: Establishing an Incident Command System (ICS) on the first day of the flood, continuous and accurate access to information, presence of a trusted local person at the time of distribution of the donated goods, and establishing household identity cards for the public.

Challenges: increased expectations of the affected people, lack of inter-organizational coordination, the occurrence of over-treatment by free service provision, parallel work of organizations, and lack of coordination in the distribution of food and health goods.

Discussion

Health outcomes are divided into short- and long-term categories depending on the flood characteristics and people's vulnerability. The mortality rate increases in the first year after a flood. There is also an increased risk of developing hepatitis E, gastrointestinal diseases, and leptospirosis, particularly in areas with low health levels. Additionally, psychiatric disorders can increase by 8.6-53% in the survivors in the subsequent year. Therefore, effective policies are strongly needed to reduce the mortality and injury rates in all countries. The global trend of urbanization, the burden of diseases, malnutrition, and maternal and child health should be addressed for the planning of flood preparedness.²⁰ It has been reported that flood has multifactorial effects on human health is. Immediate effects of flooding on health include drowning, injuries, hypertension, and animal bites. Health risks include the evacuation of patients, lack of health and medical personnel, and lack of safe health infrastructures such as medications and reserves. The medium-term effects of flooding include infectious ulcers, complicated injuries, poisoning, poor

mental status, communicable diseases, and hunger. Chronic diseases, disability, mental health problems, and malnutrition can also occur in the longer term.⁴

Over the months, when floods occur, the number of medical visits increases with skin infections, acute respiratory infections, and diarrhea. The use of community- and facility-based data can be effective in predicting health risks.²¹ The unsafe status of flood-stricken buildings in terms of construction materials and the presence of mud and slime in residential areas can delay the return of flood victims to their homes. Water supply and sewage collection systems should be also returned to pre-flood conditions because clean water and proper sewage disposal are closely related to the incidence of communicable diseases. Moreover, animal carcasses should be removed and buried as soon as possible by the authorities because they are associated with infectious diseases. Furthermore, the presence of waterlogged sites creates a suitable condition for the growth of diseases-transmitting insects, and hence it is essential to use netted windows, long-sleeve clothing, and boots to prevent insect-borne diseases. Moreover, it is necessary to track patients with specific diseases for constant monitoring of their health status. Under this situation, not receiving proper medical services can have detrimental effects on the health of these people at the individual, family, and community levels.

Flood health effects vary among populations due to different vulnerabilities. Nonetheless, the flood has a profound impact on maternal fertility and child health. It also affects the mother both psychologically and physiologically and is also associated with fertility impairment. These negative impacts can be reduced by increasing the mothers' and children's information, knowledge, and skills, particularly in low- and middle-income countries. Moreover, the related organizations must pay special attention to the health, nutrition, and safety of water.²²

Additionally, the density of airborne contaminants, including bacteria, mildew, endotoxin, and glucan is significantly higher in flood-affected houses. The inhabitants of such houses are also relatively more susceptible. There are reports of frequent respiratory problems, as well.²³ Thus, flood-affected areas of Golestan province should be examined and monitored by the experts, and people should be allowed to return to their homes after the refurbishment of the houses.

The long-term effects of natural disasters might lead to the development of anemia in children, which should be quickly identified and treated.^{24,25} An inappropriate diet can lead to digestive problems amongst the survivors.²⁶ Improper nutritional status in affected people can result in physical, emotional, and mental disorders. Supplements, daily rations, iron pills, and syrup should be distributed sufficiently

amongst children, women, and vulnerable groups to prevent malnutrition outbreak among the flood survivors. Food security and safety are the most important issues during flood events. As a large number of governmental, non-governmental, and charitable organizations are involved in the food supply and distribution, food hygiene should be constantly monitored by the responsible organizations. It is also necessary to monitor the nutritional status of individuals by a single organization (e.g. the Ministry of Health).

Flood-affected people have significant mental disorders, poor sleep quality, and susceptibility to PTSD. Hence, supportive strategies should be employed to reduce the negative health effects of floods.²⁷ Highly severe psychological symptoms were observed after flooding in Golestan province. Responsible organizations (e.g. the Ministry of Health and Welfare Organization) can reduce further disorders by systematic screening and monitoring of flood-affected people.

The death toll was very high in the people affected by the Hanoi flood in Vietnam one month after the disaster. The incidence of dengue fever, pink eye, skin infections, and psychological problems was dramatically high in the population, along with a high prevalence of infectious diseases.²⁸ However, in the Golestan flood, since the experts of environmental health and infectious diseases monitored suspicious individuals regularly, the infectious diseases were not prevalent.

In flood-affected cities around Dongting Lake in China the gross death toll, the prevalence of chronic diseases, child mortality rate, infant mortality, and total death rate were reported to be 11.7%, 51.2%, 43.1%, 10.2%, and 554.3 per 100,000, respectively. In addition, the health level of flood-hit areas was clearly associated with the incidence of diseases. Thus, health investments have to be clearly implemented in flood-prone areas with higher priority in order to manage health-related problems during a flood.²⁹ The Golestan flood had a small mortality rate due to the occurrence of a flash flood that continued as runoff and waterlogged sites in rural and urban areas. Moreover, many people immediately left their homes and sought refuge in safe areas.

The Iranian pharmaceutical companies play an important role in the drug supply chain in natural disasters, with domestic producers supplying 95% of the drug market in Iran.³⁰ An efficient supply chain delivers the drug to all needy persons in reasonable and acceptable qualities at an acceptable cost in the least possible time.³¹ Lack of medication is a major problem in disaster situations, and patients who leave their homes are in urgent need of health and medicinal services.³² The supply chain should not only have the ability to confront the hazards and disasters, but it should also have high flexibility in returning to the original state or moving towards more favorable conditions.³³ In

order to provide drugs with appropriate quantity and quality, there should be a single authority responsible for drug supply to plan and estimate the required amount of drugs, estimate and store the drugs before disasters, and store drugs in a regular recycle process of use and replacement. It is also recommended that the authorities should coordinate with pharmaceutical factories, distribution companies, and city drugstores and establish specific city areas for drug supply and storage during crisis and disaster events.

Also, in the spring flood of 2020 in Iran, the military forces played an important and decisive role. They carried out rescue operations with the cooperation of civilian forces and distributed food and health items to flood victims.³⁴

Due to climate changes and extensive changes in nature, the frequency and intensity of floods have dramatically increased over the past 50-100 years worldwide, which are more tangible compared to the past. The application of key strategies and policies by the health system to counteract such effects can reduce the destructive effects. In this respect, health policies should be developed at local, national, regional, and global levels. Supportive policies before, during, and after floods can also reduce mortality and morbidity rates.³⁵ The occurrence of natural disasters has been increasing in Iran. In addition, since human beings are the most valuable resources, special plans of preparedness and response should be designed and developed for the health system during the occurrence of floods.

Suggestions

1. Holding specialized training courses on the preparedness of healthcare personnel for flood
2. Providing necessary health facilities and equipment during the flood response phase
3. Training people to pay attention to early warnings and emergency evacuation before flood events to reduce deaths and injuries
4. Contracting with the private sector to supply health, medical, and pharmaceutical items at the response phase
5. Identifying and assessing the needs of vulnerable groups before a flood
6. Coordinating internally and externally with military organizations, Ministry of Health, and Red Crescent before a flood
7. Holding regular table-top, computerized, and operational exercises to improve the readiness of various organizations, especially healthcare personnel.

Due to the non-development of many health infrastructures in underdeveloped and developing countries, health policymakers and disaster management experts should collaborate before and after disasters to detect and resolve the flaws for reducing the health problems and challenges at

times of natural disasters especially floods to diminish the number of deaths and injuries. The health status of Golestan province was relatively good over the first 10 days after the flood. However, because of the probable long-term incidence of communicable diseases as well as mental and psychological problems, special attention should be paid to the psychological and environmental health issues.

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Authors' Contribution

MP, FR, and MAM, were responsible for the study conception and design. MAM and FR performed data collection and prepared the first draft of the manuscript. MP, FR, and MAM did the data analysis, made critical revisions to the paper for important intellectual content, and supervised the study.

Conflict of Interests

The authors declared no potential conflict of interests with respect to the research, authorship, and/or publication of this article.

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References

1. Pielke RA, Downton MW, Miller JB. Flood damage in the United States, 1926-2000: a reanalysis of National Weather Service estimates: University Corporation for Atmospheric Research Boulder, CO; 2002.
2. Guha-Sapir D, Below R, Hoyois P. EM-DAT: International Disaster Database. Université Catholique de Louvain, Brussels, Belgium. 2015.
3. Ramin BM, McMichael AJ. Climate change and health in sub-Saharan Africa: a case-based perspective. *EcoHealth*. 2009;6(1):52. doi:10.1007/s10393-009-0222-4
4. Du W, FitzGerald GJ, Clark M, Hou X-Y. Health impacts of floods. *Prehosp Disaster Med*. 2010;25(3):265-72. doi:10.1017/S1049023X00008141
5. Wakuma Abaya S, Mandere N, Ewald G. Floods and health in

- Gambella region, Ethiopia: a qualitative assessment of the strengths and weaknesses of coping mechanisms. *Global health action*. 2009;2(1):2019. doi:10.3402/gha.v2i0.2019
6. Mason V, Andrews H, Upton D. The psychological impact of exposure to floods. *Psychology, health & medicine*. 2010;15(1):61-73. doi:10.1080/13548500903483478
 7. Tomio J, Sato H, Mizumura H. Interruption of medication among outpatients with chronic conditions after a flood. *Prehospital and disaster medicine*. 2010;25(1):42-50. doi:10.1017/S1049023X00007652
 8. Neria Y, Nandi A, Galea S. Post-traumatic stress disorder following disasters: a systematic review. *Psychological medicine*. 2008;38(4):467-80. doi:10.1017/S0033291707001353
 9. Reacher M, McKenzie K, Lane C, Nichols T, Kedge I, Iversen A, et al. Health impacts of flooding in Lewes: a comparison of reported gastrointestinal and other illness and mental health in flooded and non-flooded households. *Communicable Disease and Public Health*. 2004;7(1):39-46.
 10. Few R, Ahern M, Matthies F, Kovats S. Floods, health and climate change: a strategic review. Tyndall Centre Working paper2004.
 11. Fernandez A, Black J, Jones M, Wilson L, Salvador-Carulla L, Astell-Burt T, et al. Flooding and mental health: a systematic mapping review. *PloS one*. 2015;10(4):e0119929. doi:10.1371/journal.pone.0119929
 12. Jermacane D, Waite TD, Beck CR, Bone A, Amløft R, Reacher M, et al. The English National Cohort Study of Flooding and Health: the change in the prevalence of psychological morbidity at year two. *BMC public health*. 2018;18(1):330. doi:10.1186/s12889-018-5236-9
 13. Waite TD, Chaintarai K, Beck CR, Bone A, Amløft R, Kovats S, et al. The English national cohort study of flooding and health: cross-sectional analysis of mental health outcomes at year one. *BMC public health*. 2017;17(1):129. doi:10.1186/s12889-016-4000-2
 14. Zhong S, Yang L, Toloo S, Wang Z, Tong S, Sun X, et al. The long-term physical and psychological health impacts of flooding: a systematic mapping. *Science of the Total Environment*. 2018;626:165-94. doi:10.1016/j.scitotenv.2018.01.041
 15. Walker-Springett K, Butler C, Adger WN. Wellbeing in the aftermath of floods. *Health & place*. 2017;43:66-74. doi:10.1016/j.healthplace.2016.11.005
 16. Tapsell SM, Tunstall SM. "I wish I'd never heard of Banbury": The relationship between 'place' and the health impacts from flooding. *Health & place*. 2008;14(2):133-54. doi:10.1016/j.healthplace.2007.05.006
 17. Hasanpour-Heidari S, Fazel A, Semnani S, Khandoozi S-R, Amirani T, Sedaghat S, et al. Temporal and geographical variations in colorectal cancer incidence in Northern Iran 2004-2013. *Cancer epidemiology*. 2019;59:143-7. doi:10.1016/j.canep.2019.02.003
 18. Braun V, Clarke V. Using thematic analysis in psychology. *Qualitative research in psychology*. 2006;3(2):77-101. doi:10.1191/1478088706qp0630a
 19. Schwandt TA, Lincoln YS, Guba EG. Judging interpretations: But is it rigorous? Trustworthiness and authenticity in naturalistic evaluation. *New directions for evaluation*. 2007;2007(114):11-25. doi:10.1002/ev.223
 20. Alderman K, Turner LR, Tong S. Floods and human health: a systematic review. *Environment international*. 2012;47:37-47. doi:10.1016/j.envint.2012.06.003
 21. Saulnier D, Hanson C, Ir P, Mulsted Alvesson H, von Schreeb J. The effect of seasonal floods on health: Analysis of six years of national health data and flood maps. *International journal of environmental research and public health*. 2018;15(4):665. doi:10.3390/ijerph15040665
 22. Mallett LH, Etzel RA. Flooding: what is the impact on pregnancy and child health? *Disasters*. 2018;42(3):432-58. doi:10.1111/disa.12256
 23. Hoppe KA, Metwali N, Perry SS, Hart T, Kostle PA, Thorne PS. Assessment of airborne exposures and health in flooded homes undergoing renovation. *Indoor air*. 2012;22(6):446-56. doi:10.1111/j.1600-0668.2012.00785.x
 24. Lozoff B, De Andraca I, Castillo M, Smith JB, Walter T, Pino P. Behavioral and developmental effects of preventing iron-deficiency anemia in healthy full-term infants. *Pediatrics*. 2003;112(4):846-54.
 25. Hokama T, Gushi Ken M, Nosoko N. Iron deficiency anaemia and child development. *Asia Pacific Journal of Public Health*. 2005;17(1):19-21. doi:10.1177/101053950501700105
 26. Inoue T, Nakao A, Kuboyama K, Hashimoto A, Masutani M, Ueda T, et al. Gastrointestinal symptoms and food/nutrition concerns after the great East Japan earthquake in March 2011: survey of evacuees in a temporary shelter. *Prehospital and disaster medicine*. 2014;29(3):303-6. doi:10.1017/S1049023X14000533
 27. Alderman K, Turner LR, Tong S. Assessment of the health impacts of the 2011 summer floods in Brisbane. *Disaster medicine and public health preparedness*. 2013;7(4):380-6. doi:10.1017/dmp.2013.42
 28. Bich TH, Quang LN, Thanh Ha LT, Duc Hanh TT, Guha-Sapir D. Impacts of flood on health: epidemiologic evidence from Hanoi, Vietnam. *Global health action*. 2011;4(1):6356. doi:10.3402/gha.v4i0.6356
 29. Chen M-S, Tan H, Yang T, Zhou J, Li S, Liu A. Effect of health service and its influence factors in flood disaster areas. *Zhong nan da xue xue bao Yi xue ban= Journal of Central South University Medical sciences*. 2008;33(1):21-5.
 30. Mehralian G, Rajabzadeh Gatari A, Morakabati M, Vatanpour H. Developing a suitable model for supplier selection based on supply chain risks: an empirical study from Iranian pharmaceutical companies. *Iranian Journal of Pharmaceutical Research*. 2012;11(1):209-19.
 31. Jaberidoost M, Nikfar S, Abdollahiasl A, Dinarvand R. Pharmaceutical supply chain risks: a systematic review. *DARU Journal of Pharmaceutical Sciences*. 2013;21(1):69. doi:10.1186/2008-2231-21-69
 32. Ochi S, Hodgson S, Landeg O, Mayner L, Murray V. Medication supply for people evacuated during disasters. *Journal of Evidence-Based Medicine*. 2015;8(1):39-41. doi:10.1111/jebm.12138
 33. Christopher M, Peck H. Building the resilient supply chain. *The international journal of logistics management*. 2004;15(2):1-14. doi:10.1108/09574090410700275
 34. Behzadnia MJ. The Key Role of Iran's Military Forces in the Recent Flood; a Potential Power for Civil Purposes. *Trauma Monthly*. 2019;24(3):1-2. doi:10.5812/traumamon.93465
 35. Penning-Rowsell E, Tapsell S, Wilson T. Key policy implications of the health effects of floods. *Extreme Weather Events and Public Health Responses*: Springer; 2005. p. 207-23. doi:10.1007/3-540-28862-7_20