Drinking Water Supply for Iranian troops during Iran-Iraq War (Holy Defense) in West War Zones of Iran

Mahdi Khoobdel¹, Mohamad Reza Akbari¹, Ali MehrabiTavana², Amir Adibzadeh*³

¹Health Research Center, Baqiyatallah University of Medical Sciences, Tehran, Iran.
²Health Management Research Center, Baqiyatallah University of Medical Sciences, Tehran, Iran.
³Department of Environmental Health, Faculty of Health, International Branch, Shahid Beheshti University of Medical Sciences, Tehran, Iran.

Received: 2013/9/13 Accepted: 2014/1/2

Abstract

Introduction: Safe drinking water supply plays an important role in war zones, that is, emergency situations of military forces. Achieving this goal, choosing correct water resources (quantity), planning conservation and distribution systems along with disinfection as a minimum process for water treating (quality) are the essentials for the effective prevention of water-related contagious diseases and the elimination of potential pathogens in water. During most wars, safe water supply for military forces has been one of the worries of commanders, because lack of water or its contamination may cause interruption or failure.

Methods: We performed this study through tracing the oral history narrated by 46 people who were the health personnel of Iran-Iraq war 1980-1988 in west war zones. Documentation resources, health files and contents, dissertations and written reports were used to gather required information.

Results: Drinking water during war operations in west war regions was safely supplied using these ways: 1000 liter road tanks were used, which were transported to operation regions and then chlorinated and disinfected by health technicians. As the operation continued, big road tanks which had been filled, chlorinated and disinfected in Islamabad-e-Gharb prior to the war operation were used. In the last stages, when operation progressed, small water road tanks (500 to 1200 liters) were used which had been filled, chlorinated and disinfected in Islamabad-e-Gharb prior to the war operation.

Conclusion: Due to rough terrains of the Earth, impassable roads and in some cases loss of any path roads in the west, especially mountainous regions, water supply was brought via particular methods that most of them were innovative and peerless. Altogether, water supplies to soldiers during operations in the west war zones were almost decent, whether quantitatively or qualitatively.

Keywords: Water supply, Safe water, Military, Iran, Iraq.

Introduction

Water is one of the primary resources of human welfare in any condition (1, 2). World's population is growing every day. Accordingly, Water requirements of the population become increasingly important (3). Pathogens can transmit through water and it is regarded as one of the biggest issues throughout the world. Many people die from waterborne diseases such as typhoid, cholera, giardiasis, hepatitis A, E and etc. Thus, there is always a risk of human contact with these micro-organisms through water (4-6). If the treatment is not performed correctly, it may cause infectious diseases; which put patients’ activities and their health at a high risk (5, 7). Natural disasters include drought, flood, earthquake and tsunami which are accompanied by man-made crises such as war, destroy of the environment, natural resources and human life (8). Water supply in emergency situations is of great importance. In these conditions, numerous water-borne hazards endanger human health. The first step in an emergency is to prepare sufficient water resources, even if the quality is poor (9). Water shortage or low quality water have negative impacts on human lives (10), thus, insecurity of water supply is the growing problem throughout the world (11). Water supply in emergency situations requires cooperation and coordination at vari-
ous levels of government. Under normal or emergency conditions water supply is dependent on four major factors: Source, treatment, storage and distribution; which each is important by itself (12). Water resources and supplying systems are prime targets for combat operations; therefore, protecting these facilities should take priority (1, 9). Previous studies indicate that there are many problems in this respect and risk assessment seems necessary for the large scale water supply (13).

Many health problems can occur during wars such as spread and epidemic of various infectious diseases. Among wars occurred within the last 30 years Soviet-Afghan war, Balkan wars and the Persian Gulf War are attached critical importance. Scientific evidence and numerous articles were recorded on diseases caused by the wars, especially the Persian Gulf War. The Iran-Iraq war (1980-1988) is the longest war in the 20th century. At that time, the Iranian forces, encounter with many hygienic problems such as infectious disease, Arthropod and water borne diseases (14). Also safe drinking water supply was an important problem for Iranian soldiers. Water is one of the basic requirements of the troops, which should be supplied under any condition whether normal or emergency. An adult needs between 2-4 liters of water each day (15, 16). The supply of clean water and its treatment during the 8 years of Iran-Iraq war was always of serious concern to health authorities. Water pollutants, epidemic parasitic diseases, dysentery, giardiasis and infectious diseases could undermine the Iranian forces or in some cases cause irreversible damage to the troops (17, 18). Today, water and food contamination, especially targeted at bioterrorism is an important problem for the military forces (19). Therefore, the provision of safe drinking water is one of the main pillars of public health and even more important in a security crisis (20, 21). Taking preventative measures, including careful selection of water resources (quantity), the planning for water conservation and distribution system and finally disinfection as a minimum process of water treatment (quality) can prevent many water-borne diseases. It even acquires greater significance during war conditions. Whenever in a war, an enemy may use chemical and biological weapon for polluting water sources (22).

In this paper, the provision methods of safe drinking water and water supply to the troops during the Iran-Iraq war in the west fronts were studied. Hence, all problems and valuable experiences were recorded for the future use of the military forces. Iran-Iraq war regions that including terrain and cities situations are shown in figure 1 and 2.

Material and Methods

This is a Historical Qualitative study, Oral History and Documentary Source methods were used for data collection. Documentary sources include medical records from war time archives, articles, dissertations, written reports, books, photographs and films of the Iran-Iraq war.

In the interview, the entire health personnel working in the fields of environmental health across the west regions, especially in the last 3-4 years of the war were around 40-60 experts.

Figure 1. Iran West War Regions (Terrain situations)

Figure 2. Iran West War Regions (Cities situations)

Therefore, there is no statistical sampling but according to the census all personnel were interviewed. Through the research 46 personnel were identified and interviewed. For data collection a questionnaire consisted of 41 open questions was also used. The questions were designed by environmental health specialists and methodologists. The validity and reliability of questionnaire was determined by discussion group method as well. Names and addresses of the wartime health care personnel were asked. Then, they were followed through inductive reasoning. Afterwards, they were interviewed if they met expected criterion: minimum service of 3 years as a health care expert working in the west war zones. Ultimately, the collected data were classified and then validated by comparing records from both oral and documentary sources.

Results

Safe drinking water supply and water supply in different climates and different regions according to the type and location of the unit by war veterans and medical personnel has been mentioned of both purification and conservation (sanitary and disinfection) and water supply (road tanks, thermos flask and bottles, packaged water, 20 liter containers) in details are:

1. Purification and conservation of drinking water:
Typically, the obligations of local health authorities are: water resources sanitation; disinfecting equipment and facilities usage monitoring; and water conservation and proper transfer. Chlorine tablets and Hypochlorite was often used for water disinfection. The soldiers had been
trained to use chlorine tablets for water disinfection in emergency situations. Drinking water has been purified since 1983. First, few sources were selected. Rocks or plastic were used to prevent movement of animals around the springs. Chambers were built around the springs and then water was transferred to headquarters via Polyvinyl chloride (PVC) pipes. Sanitation was performed in primary areas because it causes potential pollutants decrease and chlorination was utilized by health engineers in sanitation plant. In cases where there was no possibility of transferring water through the pipe lines, the water was stored in the tankers. In these conditions, an environmental health officer controlled water tankers. Tankers are usually covered, so there is no problem of secondary pollution. Water samples were taken from sources and sent to near laboratories for bacterial and parasitic tests. Chlorinated water was stored in rinsed tanks after ensuring the safety of the water. Measurement of free chlorine residue and Chlorination of water was made through following methods:

After running chemical and microbiological tests, and adding chlorine to the water, chlorine was measured by calorimeters and pH meters. Every two weeks, and in some cases even day by day water chlorine levels were measured and chlorinator was used for this purpose. In some war areas, where no water sources (such as wells and springs) existed, 5 and 10 thousand liter water tanks with locked gate or even 20 liter containers were transferred to the trenches. Usually, to prevent reinfection of the water in 20 liter containers, two chlorine tablets were used for each container. 1, 10 and 25 g of chlorine tablets were used for water disinfection and each soldier was given 10-20 tablets for emergency conditions. On the front lines, small tanks or containers were used for water supply and chlorine was measured by chlorimeter kits. In emergency situations, water was distributed in 1-liter plastic packs. Microbial tests were done and in most samples, coliform bacteria were negative. However, water taste changed which was ascribed to packing material. To avoid the spread of water-borne diseases such as cholera, personal and group health education was provided in the units (face to face), and the ways of proper chlorination were taught. In the cases that water was polluted with chemical agents, environmental health authorities were recommended not using water even for showering and washing. In most cases, due to insufficient facilities and equipment, troops and health forces had to detect chemical pollution from the taste, color, and other physical characteristics of the water body and eye irritation.

Some springs such as Chaghaldvand spring in Gilan-e-Gharb(34°08’ N45°55’ E) and Charmian cave springs were contaminated by chemical agents and water pollution was detected by soldiers through apparent characteristics. In addition, many springs were polluted by chemical agents in Ilam(33°41’ N, 46°16’ E), Sar-e-Pol-e-Zahab(34°27’N45°51’E) and Gilan-e-Gharb. Forces were identified with the same apparent characteristics.

2. Water supply (before, during and after operations):

2.1. Water supply before the operation was done using the following methods:

- In the first phase, water supply was performed from the cities near the operation’s area and front line.
- In the camps, mainly 1000-2000 liter tankers and stationary sources were filled by mobile tankers.
- Using urban water by plumbing: In the cases, health personnel and military forces had to plumber few kilometers to the war areas. For example, on the near Turkish border, water was transported from the top of the mountain to the forces location with PVC tubes.
- Utilizing personal thermos flask, filled from a spring, river or rain water in the west and the north-west areas. Disinfection via chlorine tablets as it had been trained to the soldiers.

2.2. Water supply during operations:

During operation due to a war situation, water supply to forces was very difficult, but special arrangements were made to solve the problems. Usually, water supply was done using 1000–18000 liter tankers during the way. For the prevention of secondary water pollution and disinfection, solid chlorine was added to the water tanks. Commonly, tankers filled with water in suitable places such as Mehran(33°07’ N46°09’ E). This process was undergone particularly at night.

Often, health technicians performed water disinfection and measured the required chlorine; then added it to the road tanks. Road Tanks carried water to the most possible nearest location. Small tanks filled by big tanks during operation. At the end of the war, before deployment of the forces and operation planning, local sources of drinking water were identified.

Using thermos or water bottles were other ways for water supply. 5-10 Chlorine tablets were given to each fighter. When the bottles’ water were finished, full it by rivers’ water and then disinfected by chlorine tablets. This method was used more in the late war (one bottle-one chlorine tablets).

Water packaged in the plastic packs and mineral waters were utilized, especially in situations where the place was under Iraq chemical attack (It was prevalent at the end of the war).

In Muslim-bin-Aqeel operations (Apr 1982 in Soomar district), rivers were polluted with chemical agents, at the beginning of the operation; used 20 liter containers were used and put into a sack which was carried by the soldiers. However, after the operation progressed, water supply was done by tankers. Most health problems were observed in this operation. Water tanks were filled in Islam-abad(34°06’ N, 46°31’ E), where water chlorination and disinfection were performed. In South war zones, due to geographical conditions water supply was different from the west war zones. Water supply often was made by water tankers.

2.3. Water supply after operations:

- After the operation, if the units were deployed in a defensive mode, the roads were constructed and water was shipped by tankers. In situations where water was not available, 20 liter water containers were carried by mules.
- Springs sanitation were done and then their water was used.
• Using plumbing water that gradually took place. In some cases, after the operations that the roads and water supply facilities were all destructed, due to possible contamination from rivers by chemical agents, soldiers could not use existing water. Therefore, forces had many problems associated with water supply, for example in Va-alfajr-1 operation (April 1983) in the North West of Fakkeh (32° 3' N, 47° 40' E).

Discussion
In the field of drinking and non-drinking water supply, interviews and documents obtained by the proposed methods which were consistent with each other. In both sources, using water tankers and springs sanitation were main sources of drinking and non-drinking water supply for military forces in the west and northwest regions. About the sanitation and conservation of drinking water, methods in verbal references and documents are completed and confirmed each other. Oral and documented sources have good detailed description about spring’s sanitation, water chlorination, measurement of residual chlorine and water quality and quantity in different war areas. Oral sources showed more detailed information about how to perform microbial and chemical tests on water.

Information about forces’ performance and use of springs’ water or other water resources in the area that was polluted by the chemical agents has been collected only from the contents of interviews and nothing was found in written documents. Totally, about the water sanitation and supply, only in the first years of the war, military forces had shortage in health facilities and health personnel’s. After 1985, many health and water facilities were given to forces and trained health personnel and experts sent to the war regions. Soldiers had less problems caused by water in the last three years of the war. Noting that obtained experiences in the field of water supply and sanitation was unique; especially in the last years of war. For example, the west region of Iran is mostly mountainous and during the war, enemy resorted to chemical attack. For soldiers’ protection, health personnel recommended specific tactics; i.e., in Muslim-bin-Aqeel operations that springs and rivers were polluted by chemical agents due to Iraq chemical attack, our troops were ordered not to use water from springs and rivers. In these situations 20 liter containers were put into sacks and were carried by soldiers. In addition, each soldier had a bottle of water and chlorine tablets for reducing total mortality.

In addition, though identification of hydrologic regions, we can use groundwater resources by drilling wells (22-26). Documentation and written reports about the water supply during operation were very limited and indicated only the thermos and water tankers. Whereas in the West, especially in the mountainous heights, tankers did not have acceptable performance and only a few lines were used in the war. In interviews, a complete report of water supply in operations was made and the unique methods which were used in the war. Experiments done on water supply and sanitation in the war indicated that workers and troops creativity was in a good fashion. These experiments can be used in disasters, operations and missions. Furthermore, the results can be used to make military forces alert about water supply and sanitation in the future. Because accessing to water supply facilities that are efficient in terms of unconventional warfare in the future is inevitable.

Storage tanks can be used to prevent contamination. Bad smell and taste of stored water are problems that may arise. Water disinfection is necessary to destroy pathogens. In some cases, you can save 5 gallons of water. When a reliable water source was found, it should be immediately replaced (27).

Purification, and water treatment plays a key role in military operations. During the war, the armed forces face the problem of providing safe drinking water. U.S. forces in the Iraq war in 2003, found the best way for water supply in bottled water. U.S. Army currently in military operations relies on bottled water. Although the ability to use bottled water for troops is difficult in actions and missions, the Army should be able to distribute water under normal and tactical conditions through the military and civilian personnel. This will help commanders to have a successful operation. In all operations, commanders and planners are to analyze different ways for water supply. According to the Dr. Strong’s theory, bottled water may get personnel to the vital needs of the funding: As a result, these services should be planned prior operation. In addition, water is a fragile resource and leaders must protect water resources; because communication lines may be cut and water supply will not be possible in all circumstances (28).

Although we collected nearly all of our experiences in the field of drinking water supplies in Iran during the Iran-Iraq War in the West, but this is not the whole experiences. In war-time, it is not possible to record all the experiments. This study was conducted years after the war. So many details were not available.

Because of rough terrains of the Earth, impassable roads and in cases loss of road in the west of the country, especially in mountainous regions, water supply during operations was fulfilled in particular via innovative and peerless methods. To sum up, water supply to soldiers during operations in the west war zones was almost decent, quantitatively and qualitatively.

Conclusion
The forces must be able to distribute water under normal and tactical conditions for military and civilian personnel. This will help commanders to have a successful operation. Therefore, it is recommended in peacetime to the regions of water supply operations and exercises and weak points of each area should be identified and attempt to solve the barriers.

Acknowledgment
This study is part of a research project that has been carried out by the financial support of Health Research Center, Baqiyatallah University of Medial Sciences. We are grateful to all health care personnel who participated in this study as well as all people who helped us to access war medical records.

References


