

# Epidemiologic profile of shigellosis among Iranian military personnel: a retrospective study in the Army

Arasb Dabbagh-Moghaddam<sup>1</sup> DVM MSc, Elnaz Tabibian<sup>2</sup> MD, Mahtab Noorifard<sup>3</sup> MD  
Seyed Javad Hosseini-Shokouh<sup>3</sup> MD, Shahram Rahimi-Dehgolan<sup>2</sup> MD  
Mohsen Tootoonchian\*<sup>4</sup> DVM MPH

<sup>1</sup>Department of Health and Social Medicine, AJA University of Medical Sciences, Tehran, Iran.

<sup>2</sup>School of Medicine, Tehran University of Medical Sciences, Tehran, Iran.

<sup>3</sup>Infectious Diseases Research Center, AJA University of Medical Sciences, Tehran, Iran.

<sup>4</sup>Deputy of Health, AJA University of Medical Sciences, Tehran, Iran.

## ABSTRACT

**Purpose:** To assess the epidemiologic features of shigellosis in Iranian military personnel of the Army.

**Materials and Methods:** The data was gathered from archived reports of Iran's Army at AJA University of Medical Sciences. All military personnel with confirmed diagnosis of shigellosis reported by the Army physicians were included in the study. Data analysis was done by appropriate statistical functions using STATA software.

**Results:** In a 7-year period (2005-2011) the total number of cases was 1710 from 25 provinces of Iran. A large difference was found out in the incidence rates of different provinces. 69% of all cases were from the five provinces of Hormozgan, Khuzestan, Sistan-Baluchistan, Bushehr and Guilan. Although the majority (55%) of the cases had occurred in spring, the association between season and incidence rate was not significant ( $P = .08$ ). Among the three studied forces 45% of reported patients were from Navy.

**Conclusion:** The overall occurrence of shigellosis has decreased among Iranian army personnel from 2005 to 2011, but the incidence is still high enough to be considered as a major problem. Army healthcare commanders are expected to improve necessary facilities, especially in the Navy and in endemic provinces, to decrease the transmission of this infection.

**Keywords:** Army; epidemiology; Iran; military personnel; shigellosis.

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## INTRODUCTION

Shigellosis is a widespread infection with a great spectrum of presentations, either a mild diarrhea or major fatal complications such as kidney injury. There are four species of this agent: *Shigella dysenteriae*, *Shigella flexneri*, *Shigella boydii* and *Shigella sonnei*. *Shigella sonnei* is most prevalent in USA, China and most parts of the world.<sup>1,2</sup> *Shigella dysenteriae* is a primary pathogen that causes classic bacillary dysentery; as few as 10 cfu are known to initiate infection in susceptible individuals.

Common symptoms of shigellosis are diarrhea and dysentery, abdominal cramps and tenesmus. Despite other

causes of diarrheal infections as a clinical diagnostic clue, shigellosis can be accompanied by fever. In fact 50% of cases have fever, compared to 18% of other diarrheal infections. Also, shigellosis can cause a longer period of disease compared to other microbial diarrhea.

Shigellosis transmission occurs through contaminated water or food or person-to-person contact. Clinical diagnosis can be confirmed by culturing stool samples using selective agar media. Since shigellosis is especially high among children, its morbidity and mortality are high in developing countries. Around 69% of cases occur in children under five and about 60% of deaths due to

shigellosis occur in this specific age group.<sup>3,4</sup> In a recent cross-sectional study in China on 3531 peoples with acute diarrhea in 2011, *Shigella* was the confirmed etiology in 13% of the cases from which 49% were children under five.<sup>1</sup>

Travelers to the developing countries and military personnel serving under field conditions are also at an excessive risk for shigellosis because of its root of transmission and their especial life styles. For instance, in a cohort study among Zionist regime soldiers, the annual incidence rates of shigellosis were 13 to 78 per 1000 person per year.<sup>3-5</sup> Studies have shown that 32% of diarrhea in military personnel has been because of shigellosis. This means that when a soldier develops diarrhea, the probability of detecting *Shigella* as its etiology is higher than the general population and even the children.<sup>6</sup>

Since there is no widespread vaccine for shigellosis and because of high antimicrobial resistance of its agent in recent years, it is best to prevent this infection by reducing its transmission among soldiers of high endemic areas.<sup>7</sup> This study was designed to recognize the areas in which prevalence of shigellosis is higher among Iranian military personnel of the Army and to find out other epidemiologic features of the disease.

## MATERIALS AND METHODS

The main objective of this retrospective longitudinal study was to assess the epidemiologic features of shigellosis in Iranian military personnel of the Army from 2005 to 2011. Here it should be emphasized that reporting cases of shigellosis is mandatory in Iran Army surveillance system. So the data was gathered from the archived reports of the Preventive Medicine Department of AJA University of Medical Sciences.

Any military personnel of Iran Army who were diagnosed having shigellosis by an army physician and confirmed by sampled cultured stool were included in this study. So at the end of each month we would be able to calculate cumulative incidence rates of shigellosis in different provinces and in the three forces of the Army based on population of each Army healthcare center. Data analysis was done based on t-test and ANOVA for quantitative variables and Chi square for qualitative ones in STATA software (version 12). *P* value less than 0.05 was considered to be statistically significant.

## RESULTS

In a 7-year period (2005-2011) 1710 cases of shigellosis were reported from 25 provinces of Iran. Based on the

analyses, the prevalence of shigellosis has been decreasing in this period (Figure 1). The maximum decrease had been from 2005 to 2006, in which the shigellosis incidence rate suddenly decreased from 918 cases per year to 247 cases per year.

Figure 2 illustrates the geographical distribution of shigellosis in different provinces among the Iranian military personnel of the Army. There was a large difference in the incidence rates of different provinces, from more than 2 per 1000 persons per year in some provinces such as Hormozgan, Guilan and Khuzestan to less than 0.2 per 1000 persons in Isfahan and Golestan. About 30% of the reported cases (485 cases, 28.3%) were from Hormozgan province and about 70% (1196 cases, 69.9%) were from the five provinces of Hormozgan, Khuzestan, Sistan-

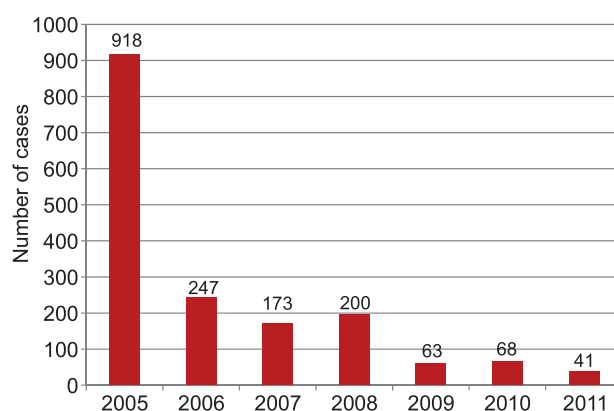


Figure 1. Number of reported cases of shigellosis among military personnel of Iran's Army in years 2005 to 2011.

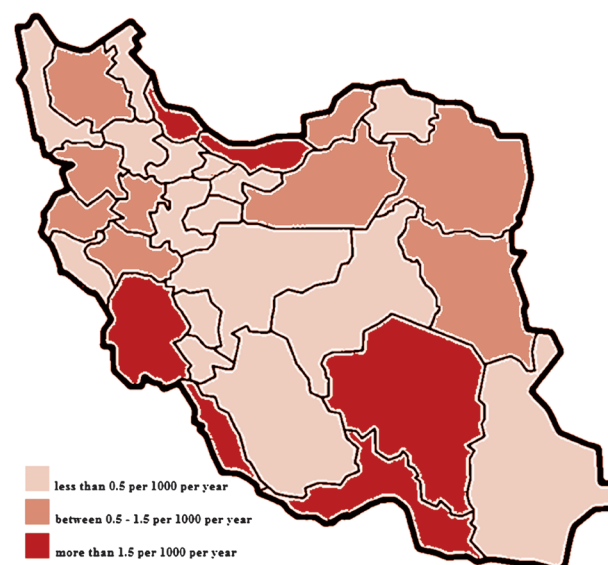
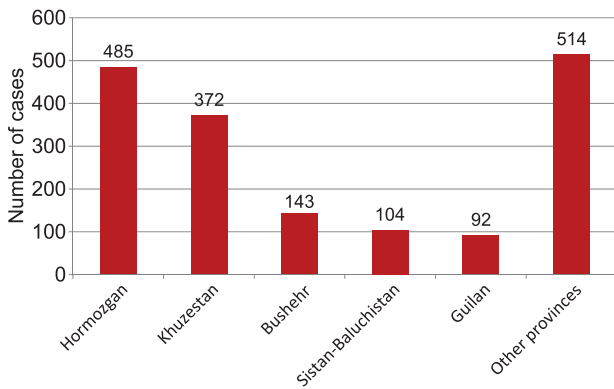


Figure 2. Geographical distribution of shigellosis among military personnel of Iran's Army in different provinces in years 2005 to 2011.



**Figure 3.** Distribution of shigellosis among military personnel of Iran's Army in different provinces in years 2005 to 2011.

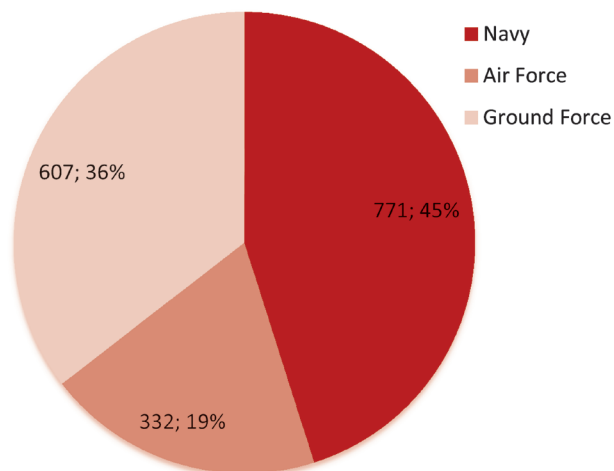
Baluchistan, Bushehr and Guilan (Figure 3).

Among the three forces of the Army, 45% of the cases (771 cases) had been members of the Navy, while only 15% of total Army population belonged to this force. So the shigellosis incidence rate of this force is more than three times greater than the Air Force and six times greater than the Ground Force. This difference was statistically significant ( $P = .002$ ).

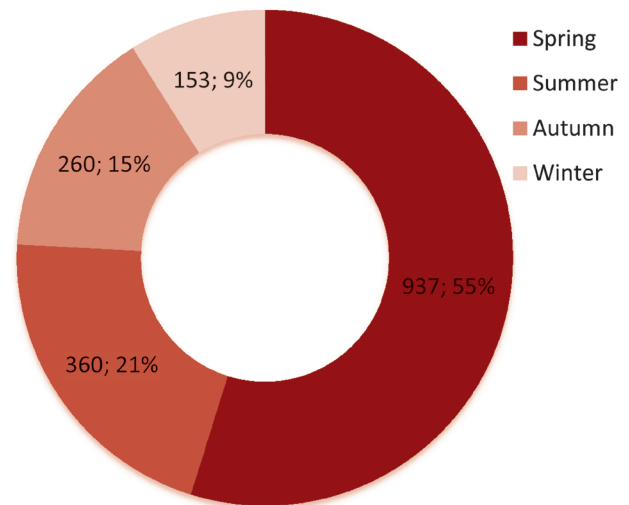
Although the majority of cases (937 cases, 54.7%) had occurred in spring (Figure 5), the association between season and cumulative incidence rate was not significant ( $P = .08$ ). The maximum number of reported cases in one season during this 7-year period belonged to Hormozgan at spring 2005 (43 per 1000 persons). This number was because of an outbreak of a contaminated common water source in one of the garrisons of that province.

## DISCUSSION

In this study the average incidence rate of shigellosis



**Figure 4.** Distribution of shigellosis among the three forces of Iran's Army in years 2005 to 2011.



**Figure 5.** Distribution of shigellosis among military personnel of Iran's Army in different seasons in years 2005 to 2011.

in Iran Army during 2005 to 2011 had been 0.5 per 1000 persons per year. This number is lower than the reported cases of zionist regime military personnel (13 per 1000 persons). However, in the zionist regime study the soldiers had not been at home but under field conditions in other countries. So the high prevalence cannot be accounted for by the national military healthcare system and should be interpreted by the operational fields' situations.

Contrary to this comparison our calculated incidence rate was about 20 times greater than the number of American *Shigella* annual reports, 2012 (0.025 per 1000 persons per year). Still these reports are for total population not just military personnel. So they may not be exactly comparable with the reports on army personnel, since the incidence of shigellosis in general population is supposed to be lower than the soldiers due to their specific life style and situations in military centers.<sup>4,8,9</sup> Also in a 14-year study in China, the incidence rate of 2.2 per 1000 persons per year has been reported which is near to our high endemic provinces such as Khuzestan (2.1 per 1000 persons per year). However, the Chinese study was also calculated in the general population not just in military personnel.<sup>3,10</sup> So the calculated incidence rate in Iran Army might be common in any other military system. However, the authors could not find the necessary information to compare the results with other countries' military systems.

Hormozgan and Khuzestan had the first rank among the provinces of Iran (3.2 and 2.2 per 1000 persons per year, respectively) and the least incidence rate belonged to Isfahan and Golestan provinces (even in some seasons these two states had no reported case of shigellosis).

This difference could be because of different climate conditions of these provinces and also using more hygienic water supplies in Army garrisons of these provinces. A Chinese study has declared that all parameters of weather including maximum and minimum temperature, rainfall, relative humidity and air pressure strongly and significantly correlate with shigellosis incidence rate.<sup>11</sup>

We have also found out that the majority of cases have occurred in spring, but the difference between seasons was not statistically significant. According to American mortality and morbidity reports “shigellosis does not demonstrate marked seasonality, likely reflecting the importance of person-to-person transmission”.<sup>12</sup>

Despite its small population compared to the whole Army, half of the reported cases were members of the Navy. This might be due to the especial life style of its personnel; living near or on sea, limited hygienic water supplies and lower level of sanitation.

## CONCLUSION

The overall occurrence of shigellosis had decreased among Iranian army personnel from 2005 to 2011. This can be because of proper preventive measures in Army military garrisons and paying more attention to healthcare issues. However, the incidence is still high enough to be considered as a major problem, especially in the Navy and in high endemic provinces. So, Army health commanders should plan for improving personnel health knowledge, hygiene and healthcare facilities in endemic areas to decrease the incidence of this important preventable infection. As it was mentioned before about 50% of all reported cases had occurred in Hormozgan and Khuzestan provinces. Thus, Iran’s Army can decrease almost half of shigellosis cases by devoting more healthcare facilities and budget just to these two provinces.

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## CONFLICT OF INTEREST

None declared.

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Corresponding Author:

Shahram Rahimi-Dehghan, MD

Address: School of Medicine, Tehran University of Medical Sciences, Poorsina St., Tehran, Iran.

Postal Code: 1417613151

Tel: +98 2184743012

Fax: +98 2184743012

Cell Phone: +98 9124113102

E-mail: [shahram.rahimi.dehghan@gmail.com](mailto:shahram.rahimi.dehghan@gmail.com)

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