

# The assessment of environmental health status in the route of Arbaeen pilgrims at Shalamcheh border in southwestern Iran

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**Date of submission:** 03 Dec 2018, **Date of acceptance:** 08 Jan 2020

## ABSTRACT

The negligence of health regulations in the preparation of the foods, services, and sanitary and welfare facilities provided in religious borders could increase the risk of waterborne infectious intestinal diseases. Therefore, the continuous monitoring and control of health indicators is essential in mourning borders. This descriptive, cross-sectional study was conducted on the Mawkebs of Shalamcheh border (n=267). In total, 186 samples were evaluated in terms of the microbial quality of water, and 66 samples were evaluated in terms of the microbial quality of food. The studied parameters in drinking water included the residual free chlorine, pH, turbidity, total coliform, and fecal coliform, and the studied parameters in foodstuffs included the total count and fecal coliform (*Escherichia coli*). According to the findings, these indicators were appropriate in terms of accommodation hygiene and preparation and distribution of crew hygiene by 99.9%. On the other hand, there were zero cases where the food sampling results were undesirable for the measurement of the total count and fecal coliform. The number of the contaminated water samples was 46 (7.24%) out of 186 water samples. Therefore, the proper implementation and continuous control of health instructions seem critical for these borders, and it is suggested that special regulations and indicators be enacted for the crew in charge, so that they would attend training courses, obtain medical examination cards, and practice personal hygiene.

**Keywords:** Environmental health, Food hygiene, Drinking water, Water quality, Arbaee

## Introduction

The World Health Organization (WHO) defines mass human gatherings as the

presence of more than 1,000 people in a specific location at a specific period. Accordingly, the largest mass gatherings in the world are Hajj and Arbaeen rituals, both of which are related to Muslims, with the latter performed for the martyrdom of Hazrat Aba Abdullah Al-Hussein (AS).<sup>1</sup>

Arbaeen pilgrimage is one of the largest religious gatherings in the world, which takes place 40 days after the anniversary of the

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**Citation:** Badeenezhad A, Parseh I, Mohamadi Asl B, Azadbakht O, Sayadi M. Analysis of the microbial quality in drinking water distribution networks using the logistic regression model in Dasht-e Azadegan county, an arid region in the southwest of Iran. J Adv Environ Health Res 2020; 8(2): 140-148





polarity increased along with oil aging, the ranges presented in Table 1 were categorized by the TPM percentage value.

Table 1. TPM waste oil range

Qualitative Interpretation	Percentage
Without contamination	0-14%
Warning limit	14%-24%
Contamination	More than 24%

The researchers confirmed that the polar parts that were removed from the oxidized oil exerted poisoning effects on animals, and it is recommended that oils with more than 24-27% of TPM be removed. The legal limit point for the oils has been set at 25%.<sup>13</sup> On the other hand, free fatty acids are used for the evaluation of oils during the storage period and are not suitable for assessing the impact of temperature on the oil.

#### **Salt/TDS tester**

As the standard salinity of bread is limited to 1% and bread is one of the major sources of salt intake in Iran, the salt value was rapidly tested using Salt/TDS tester. In case of high salinity, the consequences of the excessive use of salt (e.g., hypertension) were described to decrease their prevalence in the long run.

#### **Surface contamination**

Rapid surface analysis was performed using rapid portable surface test equipment. The ranges of microbial contents were categorized based on the RLU, and RLU of less than 10 was defined as a non-contaminated environment, while the RLU of 15-40 was defined as an alarming level, and RLU of  $\geq 40$  was described as contaminated.

#### **Injection thermometer**

An injection thermometer is used to measure food temperature. The critical range for food products is 4-60 °C, and the products should be preserved at temperatures below 4 °C or above 60 °C.

#### **pH Meter**

To detect the baking soda in food products, the pH of below 6.4 in the samples was considered acceptable, and the pH of above 6.4 was considered unacceptable.

### **Aflatoxin**

Due to the poisonous effects and carcinogenicity of aflatoxins, these compounds must be evaluated and detected in various food products. The permissible limit of aflatoxins in human food has been set at 50 ppm by the Food and Drug Administration (FDA).

### **Hygrometer**

According to the findings, the optimal humidity of the food stores that have been detected with Hygrometer was within the range of 55-65%. The Microsoft Excel software was used to describe the obtained data.

## **Results and Discussion**

The present study aimed to assess the environmental health status on the route of the Arbaeen pilgrims at Shalamchek border. To maintain the health of the pilgrims who travel to holy shrines, the supply of healthy water, food, and settlement in accordance with health indicators is critical.<sup>14</sup> Fig. 2 depicts the number of the free service stations versus the inspection visitors per day. As can be observed, the number of the stations increased while nearing to Arbaeen day.

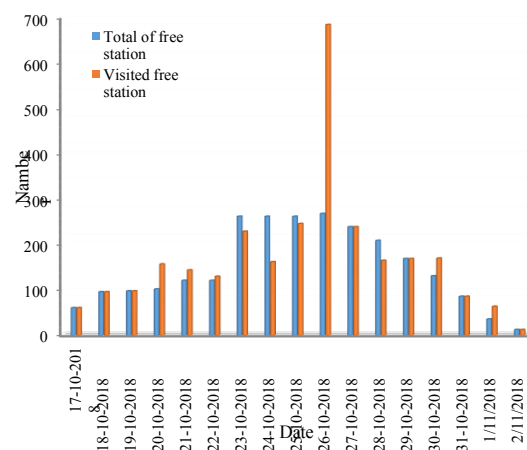


Fig. 2. Number of free service stations and number of visits per day

As there were Mawkebs with more than one visit per day, the number of the visited station per day was observed to be more than the stations on the same day in the current research. In general, the obtained results indicated the proper status of Mawkebs in

terms of health. Fig. 3 shows the number of the inspections from the accommodations per day. As is depicted, the number of the settlement areas varied depending on the population. In addition, spacious tents were set up for settlement in each Mawkeb, and the difference in the number of the inspections with the number of the Mawkeb was due to the multiple inspections of the Mawkeb per day. The inspections also revealed that 99.9% of the accommodations were healthy.

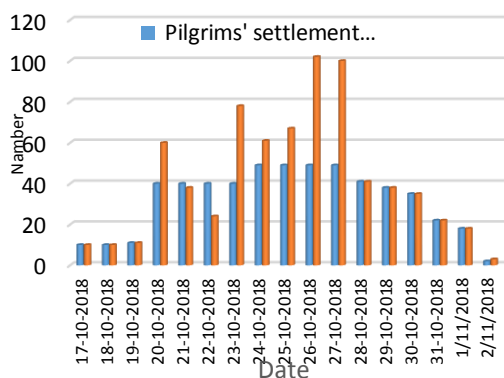


Fig. 3. Total number of pilgrim accommodations and inspections per day

In the current research, the inspections indicated that all the WCs were cleaned on a daily basis and had proper health conditions. Furthermore, the recommendations of the health manager were properly implemented, and 99.9% of the WCs and bathrooms were properly healthy. In the studied stations in the present study, some disinfectants (e.g., halamid and perchlorine powders) were also used to disinfect and remove the surface contaminations of the sanitary services. In order to control insects, rodents, and vectors, 2.5% permethrin and 10% cypermethrin poisons were used.

In a study in this regard, Masoumbeigi *et al.* assessed the sewage disposal, reporting its proper status in some military centers. The presence of a sewage network was a proper indicator of health in the studied cases of the current research. This was also considered to be the highest scored indicator in the WHO evaluations in this regard.<sup>15</sup> In the current research, each Mawkeb or adjacent Mawkebs implemented septic tanks to dispose of the sewage that was discharged by sludge trucks when needed, and the status was observed to be properly healthy.

To maintain the health of the pilgrims, some health recommendations about the disinfection of WCs and bathrooms, solid waste collection, discharge of septic tank, firefighting equipment of station and first-aid kit, and water chlorination were also presented in addition to direct control.<sup>8</sup> The results obtained by Zazouli *et al.* regarding the environmental health status of mosques and holy places in Amol city demonstrated that 69.9, 68.7, and 47% of the mosques, mourning places, and holy shrines had a favorable status, respectively.<sup>16</sup> Also, the results of the evaluation of the health status of the mosques and holy places in Sari (Iran) in 2016 revealed that the private health level of the individuals in the mosques was relatively low although it is highly critical. Furthermore, the mosques in Sari are structurally moderate and have moderate equipment. In general, the mosques in Sari have been reported to have a lower health level than expected.<sup>17</sup>

### Foodstuffs

Food hygiene and safety is an important principle for the prevention of human diseases and protection of the environment against contamination. The foodborne diseases caused by microorganisms are a major public health concern.<sup>18</sup> Unhealthy foodstuff preparation, production, and distribution, as well as the lack of food evaluation and supervision systems could lead to gastrointestinal diseases.<sup>7</sup>

Considering the high prevalence of foodborne diseases and their increased importance during distribution in public, the negligence of health recommendations increases the risk of intestinal diseases and may even lead to epidemics among pilgrims, and the consequences not only harm these individuals, but they also threaten their local community when they return home.<sup>14, 2</sup> Therefore, the managers of mourning boards are expected to care about the food production process using simple, yet important health issues. During the current research, direct supervision by the managers was recommended for the food production process. The practice of personal hygiene and having health registration medical

examination cards were also evaluated in the managers of food distribution.

As huge places such as Mawkeb kitchens produce large amounts of corruptive wastes, constant control must be imposed for the disposal of these wastes.<sup>19</sup> In the current research, special solid waste trucks equipped with leachate gathering systems were employed for this purpose on a daily basis. Considering the direct correlation between the implementation of health regulations by the crew and the corruption of food,<sup>4, 5</sup> the limited knowledge regarding food protection could damage the pilgrim crowd irreparably. As such, the crew in charge of food production

and distribution must be extremely careful of health.

Fig. 4 shows the total number of the food production places and daily inspections in the studied area. The public food production centers also varied as they may have been inspected several times per day.

The results of the present study indicated that the health status of the food production centers was suitable in 99.9% of the cases, and the crew in charge practiced personal hygiene, and the food production and distribution procedures were completely healthy as well. Fig. 5 depicts the results of food sampling.

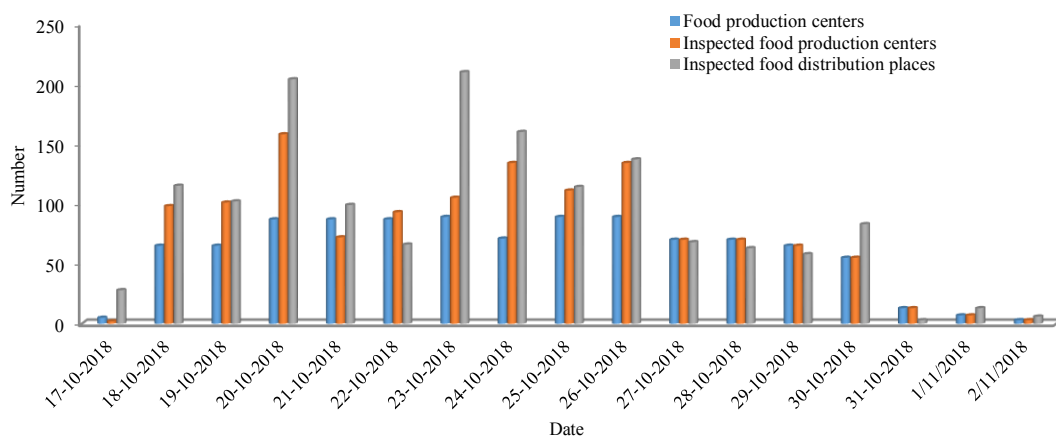


Fig. 4. Number of food production centers and inspections

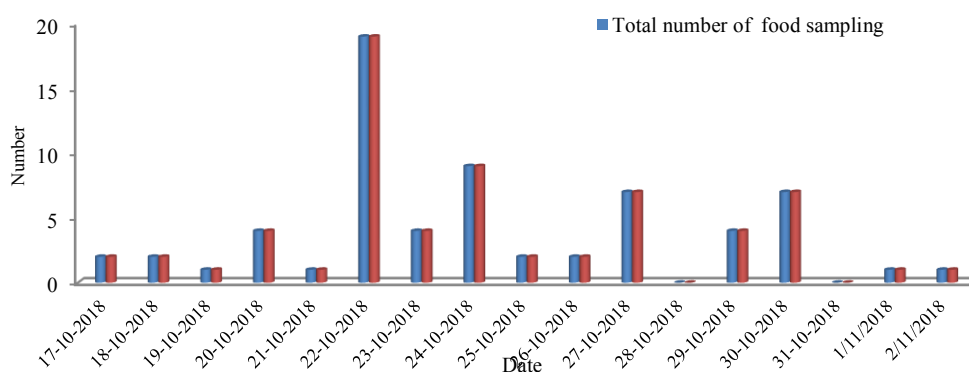


Fig. 5. Number of food samples and samples with favorable results

As is shown in Fig. 5, all the samples are evaluated as proper, and no unacceptable cases were reported. During the inspections, no suspicious food was eliminated, and the statistics recorded no cases of food poisoning. In the study by Faramarzi *et al.*, the assessment of food production for mesophilic bacteria demonstrated that salads (50%) and protein products (36.6%) had the highest

contaminated cases, while the highest to lowest contamination rates were observed in sweets (13.46%) and protein products (1.73%) for coliform contamination, salads (58.33%) and diaries (9.84%) for *E. coli* contamination, and sweets (4.81%) and diaries (0.39%) for severe staphylococcus contamination, respectively<sup>20</sup> In addition, the evaluation of the health indicators at the

hotels in Qom (Iran) indicated that 35.5% of the cases had a proper health status, while 54.8% were included in the rehabilitation indicators, and 9.7% were considered to be undesirable.<sup>21</sup>

According to the information in Table 2, approximately 88.8% of the oils had a suitable status, which was equal to 175 out of 197 cases with the TPM of less than 14%. And also, the results detected by Salt/TDS tester show the salinity exceeded 1% in 27 (21%) out of 128 samples. Investigation for surface contamination revealed the

contamination level of the equipment and environment was suitable in 40.5% of the cases. In addition, 21 out of 57 samples had acceptable humidity. According to the information in this Table, the food samples were considered suitable in terms of aflatoxin production. In the current research, the percentage of desirable results measurement with injection thermometer was achieved in 74.7% of the cases. In total, 96.3% of the samples were properly included in this range for pH.

Table 2. Tests implemented on food products, number of samples, and percentage of desirable samples

Parameters	Total number of samples	Number of desirable samples	Percentage of desirable results
Total Polar Materials (TPM)	197	175	88.83249
Salt/TDS Tester	128	101	78.90625
Surface contaminate	158	64	40.50633
Injection thermometer	776	580	74.74227
pH meter	55	53	96.36364
Hygrometer	57	36	63.15789
Aflatoxin	3	3	100
Food contamination	17	11	64.70588

In another research conducted in Isfahan (Iran), Zangiabadi *et al.* evaluated hotels with restaurants, and the environmental health status in 9% of the units was reported to be excellent, while favorable status was observed in 45%, moderate status was reported in 36, and 9% of the units had a poor status.<sup>22</sup>

### Water

Water is the most important and most consumed material during a trip, which mainly contributes to digestive diseases among travelers if contaminated. Fig. 6 shows the number of the drinking water reservoirs for the pilgrims and inspected reservoirs per day.

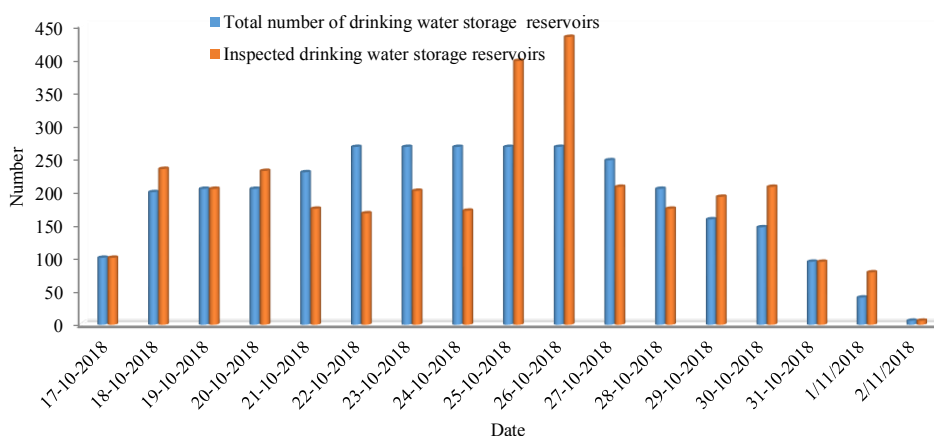


Fig. 6. Drinking water reservoirs and number of inspected reservoirs per day

In the current research, the water reservoirs were polyethylene barrels, and the Water and Wastewater Organization (ABFA) trucks distributed water in the Mawkebs. The water was used for both drinking and sanitary purposes and supplied from the water

treatment plant in Khorramshahr. Every reservoir was inspected several times per day. After sampling, the routine tests of drinking water were performed on the samples for the measurement of the free residual chlorine, pH, turbidity, total coliforms, and thermodynamic

coliforms.<sup>23</sup> Fig. 7 depicts the number of the water samples in the studied area and undesirable samples. Accordingly, 46 (24.7%) out of 186 water samples were considered undesirable. In most of the water reservoirs, the residual chlorine was acceptable, and the inspection of chlorine was performed constantly.

According to the study by Masoumbeigi *et al.* regarding the bacteriological and chemical water quality of some military centers, water hygiene was excellent in 60% of the cases, while it was moderate in 20%

and poor in 20% of the samples. Furthermore, the mentioned study indicated that with the exception of one case, the rest of the samples had exceeding contents of nitrate, and the other indicators of water quality control were also suitable. Previous findings and direct observations have also shown that 99.9% of the food, water reservoir, production, and distribution location health status and the health status of the crew in charge of food production and distribution have been proper.<sup>15</sup>

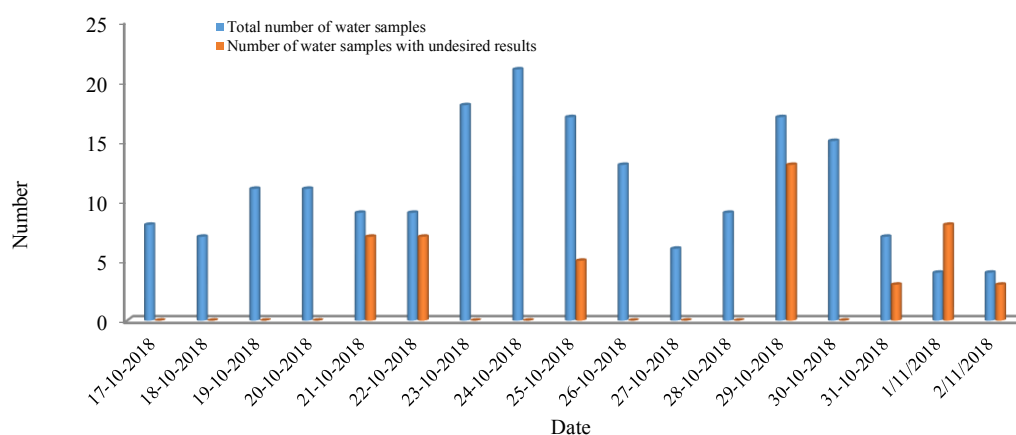


Fig. 7. Number of water samples and their results

## Conclusion

According to the results, the environmental health status, food, and drinking water hygiene used for Arbaeen pilgrimage along the Shalamcheh road was proper. It is recommended that special health criteria and indicators be considered for setting up free service stations and all the employees take the required training courses to obtain medical examination cards and practice personal hygiene as a priority.

## Funding/Support

This research project was financially supported by Abadan School of Medical Sciences (contract number: 96H-369 dated 20-9-2018; code: IR.ABADANUMS.REC.1397.010).

## Conflicts of interest

None declared.

## Acknowledgments

Hereby, we extend our gratitude to the Research Committee of Abadan School of

Medical Sciences for assisting us in this research project.

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