



An insight into the drinking-water access in the health institutions at the Saharawi refugee camps in Tindouf (Algeria) after 40 years of conflict



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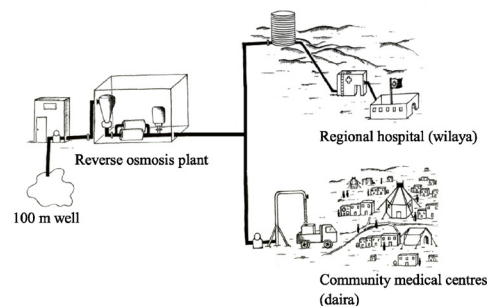
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HIGHLIGHTS

- Drinking water access at the Saharawi refugee camps (Algerian desert) was assessed.
- Risk of microbial Contamination of water storage tanks was medium-high on average.
- Raw water with high levels of fluoride is still used directly by two refugee camps.
- Pending issues: treated water for all, monitoring, adequate storage and maintenance.
- Potential health impact associated to water quality should be further studied.

GRAPHICAL ABSTRACT



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ABSTRACT

Drinking water access in the Saharawi refugee camps located in the Algerian desert is a challenge that is still an on-going problem after 40 years of conflict. This work presents an analysis of the situation with emphasis on the water supply in health institutions (quantity and quality) including both sanitary inspections and a comprehensive water quality study. Results from sanitary inspections show that only half of the water supply installations at the hospitals are in adequate conditions and the rest present high risk of microbiological contamination. Water access in small medical community centres on the other hand present issues related to the non-availability of food-grade water tanks for the institutions (70%), the use of small 10 l containers as the main water supply (40%), poor maintenance (60% under antihygienic conditions and 30% with damaged covers), and insufficient chlorine levels that prevent microbiological contamination. Regarding water quality analyses, raw water supply in Smara, El Aiun and Awserd camps present high conductivity and high levels of fluoride, chloride, nitrate and sulphate, but dropping to normal levels within the drinking-water standards after water treatment via reverse osmosis plants. But for the case of El Aiun and Awserd, the reverse osmosis plant only provides treated water to the population each 20 days, so the population receives raw water directly and health risks should be evaluated. Finally, Dakhla water supply is the best in terms of physico-chemical parameters quality, currently providing safe drinking water after a chlorination stage. In summary, drinking water access has improved dramatically in the last years due to the efforts of local and international authorities but several issues remain to be solved: access to treated water for all the population, improved water quality controls (especially in Dakhla), expansion of distribution networks, and adequate storage systems and maintenance.

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1. Drinking-water access at the Saharawi refugee camps: An historical overview

Guaranteeing drinking-water access at refugee camps is a worldwide challenge that affects directly the public health of the refugee population, especially when resources are scarce and in cases of chronic crisis, the so-called the ‘protracted refugee’ situations (populations of at least 25,000 who have lived in exile for at least five years in developing countries) (Loescher and Milner, 2008). Among the longest refugee camps, there are the Palestinian population in Gaza, Jordan, Lebanon and the West Bank (more than 65 years now) and the Saharawi camps in Algeria (40 years).

Saharawi refugee population is one of the ‘forgotten’ international conflicts. After 40 years, there is still no significant advance in the peaceful political conflict resolution. Meanwhile, about 165,000 refugees – according to local authorities and the estimations of the Government of Algeria – live under the harsh conditions of the Sahara desert, with very limited access to basic needs, including those related to health, energy and water.

Saharawi refugee camps were established in 1975 in the initial stages of the international conflict in Western Sahara. At present, they are composed by one institutional centre (Rabouni) that comprises the ministries and administrations; and five refugee camps, all located near Tindouf (Algeria). These refugee camps are divided in five ‘wilayas’ or administrative regions (Fig. 1): El Aiun, Awserd, Smara, Dakhla and Boujador (Boujador is near Rabouni, not shown in the Figure).

Drinking-water access has been one of the main concerns since early days of the refugee situation. But during the last 40 years, there have been different stages of progress of the water supply access according to the historical evolution of the camps and the non-resolution of the conflict, which is yet to find a solution. From the first temporary

‘emergency’ shallow handmade wells there has been a deep and difficult process to undertake further actions and improve the water supply systems. As the time has passed, the refugee camps have become similar to those corresponding to a permanent – ‘prolonged crisis’ – settlement, and the water supply systems reflects this situation, although they have been always designed with the required adaptations so they can keep ‘portable’ characteristics in case the conflict resolves and the Saharawi population return to Western Sahara:

1.1. Stage I (1975–1993) – shallow groundwater wells

At first, when the camps were initially created in 1975, the main characteristic of the drinking-water supply was of ‘temporality’, as the Saharawi population expected the return to their land after a relatively rapid conflict resolution. With this important issue present, the water supply in this first period consisted of traditional handmade shallow groundwater wells and superficial ponds dug at El Aiun and Dakhla. These wells and ponds supply 75% of the population, up to 20 l/person/day, which is above the minimum standard given by the Sphere Project (15 l/person/day) (The Sphere Project, 2011) or the (WHO, 2011a). Water quality was originally good, although contamination was a main risk and water quantity was seriously limited.

1.2. Stage II (1994–1999) – deeper groundwater wells (~100 m)

In 1994, strong rains caused devastating floods that contaminated the shallow water wells because of lack of sanitation (no drainage systems), contributing to a cholera epidemic at El Aiun. This led to a considerable change in the water supply management at the camps, including water microbiological analysis from that moment onwards (*Escherichia coli* and total coliforms analysis). Deeper groundwater wells of about

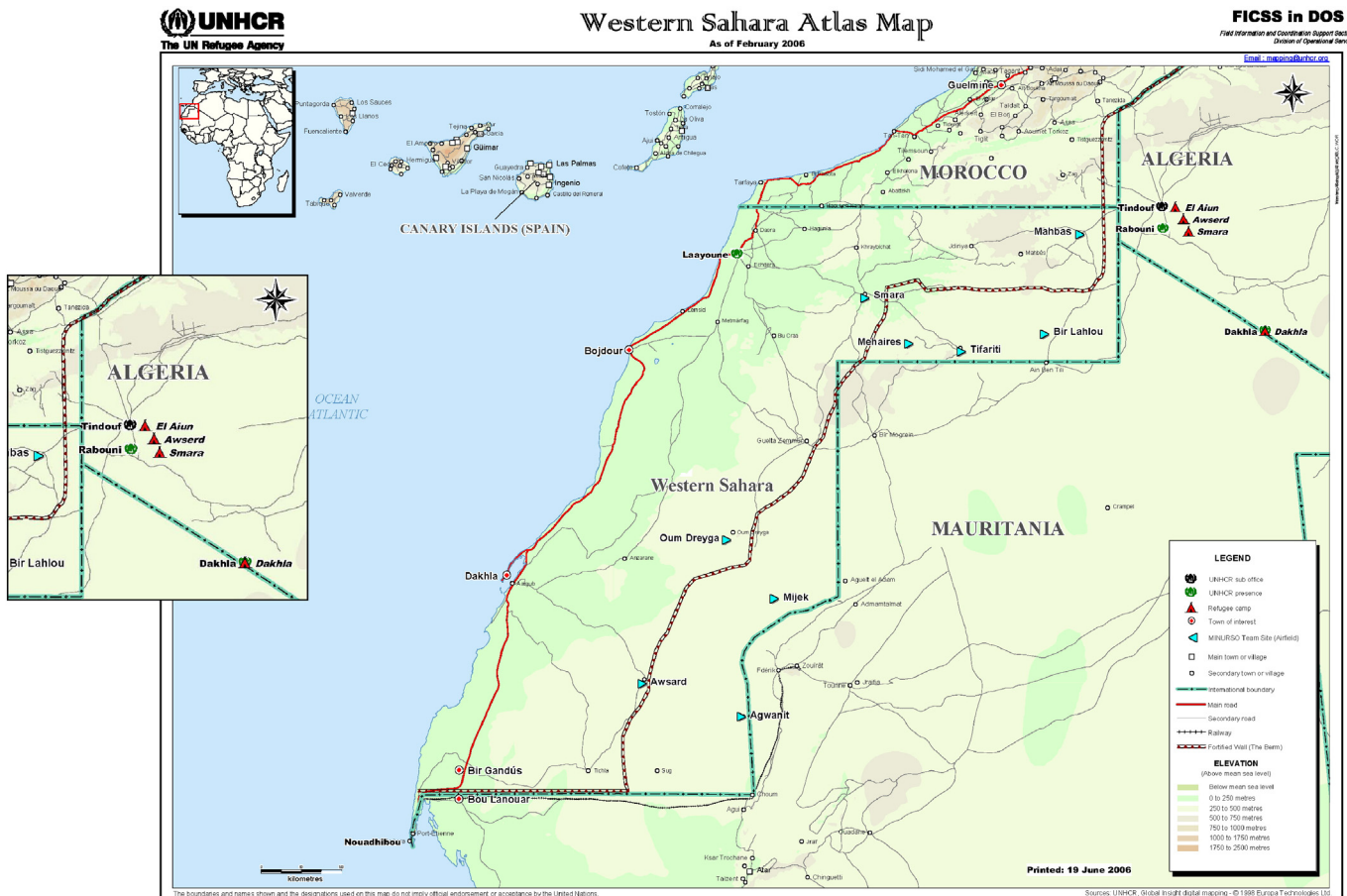


Fig. 1. Map of Western Sahara (UNHCR 2006) and outline of the Saharawi camp area, showing the different wilayas.

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