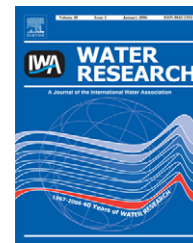


Available at www.sciencedirect.comjournal homepage: www.elsevier.com/locate/watres

The quest for safe drinking water: An example from Guinea-Bissau (West Africa)

Adriano A. Bordalo^{a,b,*}, Joana Savva-Bordalo^c

^aInstitute of Biomedical Sciences, University of Porto (ICBAS), Lg. Abel Salazar 2, 4099-003 Porto, Portugal

^bCiimar-Centre of Marine and Environmental Research, Rua dos Bragas, 289, 4050-123 Porto, Portugal

^cInstituto Português de Oncologia, Rua Dr. António Bernardino de Almeida, 4200-072 Porto, Portugal

ARTICLE INFO

Article history:

Received 18 August 2006

Received in revised form

19 January 2007

Accepted 9 March 2007

Available online 24 April 2007

Keywords:

Drinking water

Fecal coliforms

Water quality index

Bolama

Guinea-Bissau

Africa

ABSTRACT

While humans require water for life, one-sixth of our species lives without access to safe water. In Africa, the situation is particularly acute because of global warming, the progression of the Sahara desert, civil unrest and poor governance, population growth, migration and poverty. In rural areas, the lack of adequate safe water and sanitary infrastructures leaves millions with doubtful water quality, increasing the harshness of daily life. In this paper, a pilot study was conducted during the wet season on Bolama Island (Guinea-Bissau, West Africa), a UNESCO Man and the Biosphere Reserve. Twenty-eight shallow wells, supplying water to most of the population, were sampled for microbiological, physical and chemical water quality characteristics. A ten-parameter water quality index (WQI) adapted to tropical conditions was applied to compare the different wells. About 79% of the wells showed moderate to heavy fecal contamination. From the surveyed parameters, it was found that chemical contamination was less important, although all samples were acidic, with the pH averaging 5.12 ± 0.08 . The WQI was $43 \pm 4\%$ (0%—worst; 100%—best quality), showing that the water from the majority of wells was polluted but should be suitable for domestic use after appropriate treatment. At the onset of the wet season, diarrhea represented 11.5% of all medical cases, 92.5% of which were children aged <15. This paper suggests inexpensive steps to reduce the fecal contamination and control the pH in order to increase the potability of the well water and, concomitantly, to raise the living standards of the population in one of the poorest countries of the world.

© 2007 Elsevier Ltd. All rights reserved.

1. Introduction

The access to safe and sufficient water and sanitation are basic human needs and are essential to health and well-being of the human population (UN, 2006). Sub-Saharan Africa has the highest proportion of poor people in the world, 44% of the population in 2002 (World Bank, 2006), but shows the fastest population growth (approximately 2.2% a year), with a

subsequent increased pressure on water resources. Although water is abundant in the region, particularly in coastal West Africa, most of the population lacks adequate and safe drinking water and improved sanitation. As a consequence of poor hygiene, diarrhea is the most common condition, its effect being greatest among children under 5-years old (Helmer, 1999). Owing to problems in planning and absence of sound monitoring programs, the water quality is, in most

*Corresponding author. Institute of Biomedical Sciences, University of Porto (ICBAS), Lg. Abel Salazar 2, 4099-003 Porto, Portugal. Tel./fax: +351 222 062 284.

E-mail address: bordalo@icbas.up.pt (A.A. Bordalo).
0043-1354/\$ - see front matter © 2007 Elsevier Ltd. All rights reserved.
doi:10.1016/j.watres.2007.03.021

cases, unknown, thus making difficult the design and implementation of measures to improve characteristics of the water in order to make its consumption safe and not a source of disease. Moreover, as many as 22 African countries fail to provide safe water for at least half their population (deVilliers, 2002), 14 of them in the sub-Saharan region located north of the Equator.

The Republic of Guinea-Bissau, a former Portuguese colony, is located in sub-Saharan West Africa (Fig. 1). A coastal country with the only estuarine delta in the region, it contains an enormous biodiversity. Most of its 28,000 km² land area are covered with tropical rain forest (85%). Two seasons exist: wet with SW winds from June to November and dry, with NE winds from December to May.

The estimated present population of 1,586,000 (WHO, 2006a) has nearly doubled in the last 25 years. Life expectancy at birth is low (46.9 years), and the official HIV/AIDS prevalence rate reaches 10% (WHO, 2001). Communicable diseases such as endemic malaria, diarrhea (including cholera) and respiratory infections dominate. Health infrastructure is minimal and was greatly affected during the civil unrest in the late 1990s. With a per capita GDP of \$240 (UN, 1997), Guinea-Bissau is one of the 10 poorest countries of the world, with over 50% of the population living below the poverty line.

The most recent estimate of total per capita water withdrawal for Guinea-Bissau is 49 l per day with 63% of the water used for agriculture and 31% allocated for domestic needs (WHO, 2000), i.e., each person has only 21 l of water available for daily personal needs. This value is well under the 50 l minimum water requirement for human domestic use (Gleick, 1998). On average, adequate water supply and sanitation cover less than half of the population (INEC, 2004). The water distribution networks that exist date from the colonial period and are mostly restricted to the capital,

Bissau (ISDS, 2006). Thus, only 13.6% of the population has access to potable water, and no treatment of public wastewater is available. Outbreaks of cholera (from contaminated water through food and drinking water) are common. In 2005, during the wet season, 14,303 cases of cholera were diagnosed and 252 people eventually died (WHO, 2006a).

The Bolama-Bijagós Archipelago (Fig. 1) was designated a UNESCO Man and the Biosphere Reserve (MAB) in 1996. Bolama Island, a former colonial capital, is the most populated island that does not have any working water network. The 6000+ inhabitants retrieve water for domestic needs from shallow wells. No data on water quality are available, and the eventual link between water quality and human health has never been assessed, making it impossible to estimate the risk for the entire population. Moreover, one of the authors was assigned a 3-month rotation resident medical officer for the NGO AMI (International Medical Assistance) program in Bolama and the preponderance of water borne diseases paved the basis for the research presented here. Thus, the impetus for this paper was to: evaluate the water quality of well water during the wet season; assess the impact on human health of the water quality; and tentatively design comprehensive measures to improve water quality in the short-term.

2. Material and methods

2.1. The environment

The Bolama-Bijagós archipelago consists of 88 islands and islets within the ancient delta of the River Geba and River Grande. Bolama Island is located at 11°N and 15°W (Fig. 1). The area is influenced by the Canary current, from the north, and the Gulf of Guinea current from the south, creating

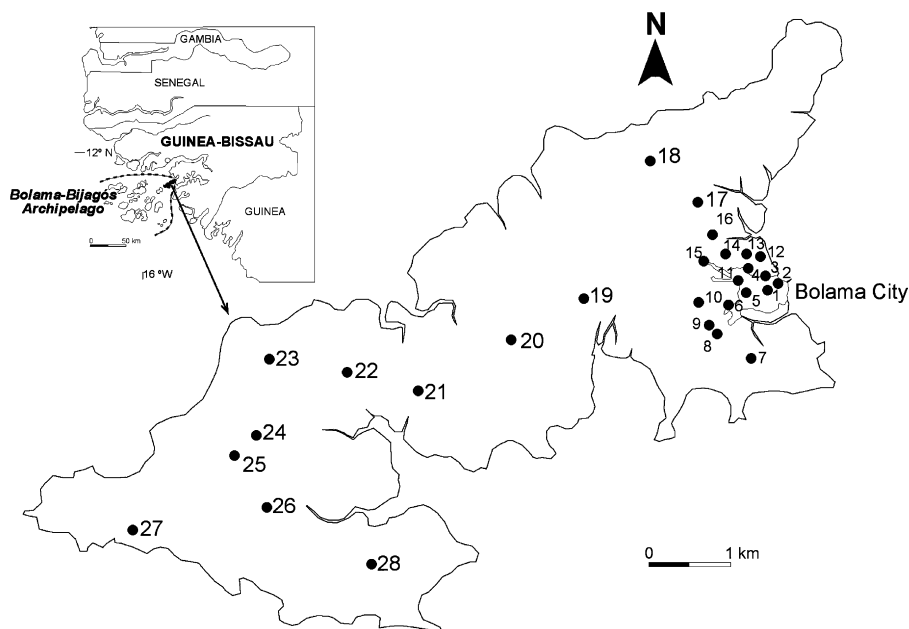


Fig. 1 – Location of sampling stations in Bolama Island, Guinea-Bissau.

Download English Version:

<https://daneshyari.com/en/article/4484010>

Download Persian Version:

<https://daneshyari.com/article/4484010>

[Daneshyari.com](https://daneshyari.com)