The role of climate on prevalence or eradication of vesical schistosomiasis in Khuzestan Province of Iran

Dariush Hamidinia · Sharif Maraghi ·
Farideh Azimi · Armin Ai · Sadegh Shirian

Received: 1 April 2014 / Accepted: 5 August 2014 / Published online: 24 August 2014
© Indian Society for Parasitology 2014

Abstract Climate is defined as the combination of climate and air elements of a given region which is usually measured for a period of decades. De-marton climate classification has been established based on many factors, including elements such as temperature and rainfall. Vesicle schistosomiasis is a parasitic disease caused by *Schistosoma haematobium*. This parasite lives in the blood vessels of the bladder. The parasite can cause hematuria in human and if not treated properly can lead to vesicale carcinoma. The parasite is distributed only in certain parts of the province and it is highly dispersed along the rivers of Dez, Karkheh and Karun with high emissions. In 1970, the prevalence of infection in infected foci was 23.8 %. Campaign against the parasite began in 1958 but it did not

encompass all centers of infection. Preventive measures include diagnosis and treatment of patients, public health promotion, health education, drying swamps and ponds, improving the environment, cementing the irrigation canals, and the use of molluscicide eventually leads to changing the ecological and conditions of parasite and snail inhabits. Application of preventive measures resulted in the reduction of infection level to 0.7 % in 1979. By continuing struggle and intensifying preventive measures and changing ecological and climatic environment, in 2008, the examination of 3400 urine samples of students in Andimeshk district revealed no cases of the vesical schistosomiasis. It is concluded that *S. haematobium* and vesical schistosomiasis is eliminated from Khuzestan province southwest Iran, but the disease is still prevalent in neighboring Iran's western border country (Iraq) and due to the special conditions of its facilities and the traffic between the two countries, it is necessary to control and eradicate the disease in Iraq by using the experiences of Iran in eliminating the disease.

Keywords Climate · Vesical schistosomiasis · *Schistosoma haematobium*

D. Hamidinia
Ahwaz Islamic Azad University, Ahwaz, Iran

S. Maraghi
Department of Parasitology and Mycology, Abadan Arvand International Division, Infectious and Tropical Diseases Research Center, Thalassemia and Hemoglobinopathy Research Center, Ahwaz Jundishapur University of Medical Sciences, Ahwaz, Iran

F. Azimi (✉)
Department of Geography, Ahwaz Islamic Azad University, Ahwaz, Iran
e-mail: Ahvazuniversity@yahoo.com

A. Ai
Faculty of Dentistry, Tehran University of Medical Sciences, Tehran, Iran

S. Shirian
Brain and Spinal Cord Injury Research Center, Tehran University of Medical Sciences, Tehran, Iran
e-mail: shirian@shirazu.ac.ir

Introduction

Climate is the combination of climate and weather elements in a given region which is usually measured for a period of decades. De-marton classification of climate is based on many factors including elements such as temperature and rainfall. In this classification, the hot and cold courses, annual rainfall, evaporation and temperature and its correlation with wet and dry periods are taken into consideration (Jafarpour 2011).

Iran is a large part of the plateau of Iran in Southwest Asia and the Middle East, between 25° and 40° north latitude and 44°–64° east. The southern half of the country is near the subtropical region and the northern half is located in the northern region of the earth (Jedari Eivazi 2010). Iran is geometrically in the form of a tetrahedron fairly regular and almost like a diamond. The maximum width of Iran from northeast to southwest Sarakhs (the border with Turkmenistan) to the mouth of the Arvand river (Abadan–Khorramshahr), is about 1400 km (Alaei Taleghani 2009).

Khouzestan province with an area of 64, 057 square kilometers is in the southwestern part of Iran along the Persian Gulf and Arvand river in the range of 5°–47° and 42 and 39 min east of the Greenwich meridian and 29° and 58 min north of the equator. 40 % of the area is mountainous and about 60 % of its territory is paved a post is made up of plains (Ashtari et al. 2012).

The average temperature in the coldest month of the year is 11.2 and in the warmest month is 53.6 °C (Alijani 2009). Khuzestan province with input capacity of 33 billion cubic meters of water per year and having 3 billion cubic meters of water stored in underground aquifers has a prominent position in the country (Ashtari et al. 2012).

The majority of parasitic diseases is found in tropical and subtropical regions (Shirian et al. 2014; Oryan et al. 2013; Shirian et al. 2012; Daneshbod et al. 2011). Vesicle schistosomiasis is a disease caused by the human worm called *Schistosoma Haematobium*. This worm lives in the vessels surrounding the bladder. Human infections can cause acute hematuria (blood in urine) and in the long term if not treated properly can lead to fiscal carcinoma (bladder cancer). The parasite is also found in many regions of Middle East (Arfaa 1972; Azar and Zurayf 1972; Baquir 1975; Al-Kawaz 2007).

The disease is found in the southwestern Khuzestan province, in the Dez, Karkheh and Karun in the cities of Andimeshk, Dezful, and Susa towards Ahwaz, Abadan, Khorramshahr and Dashte- Azadegan adjacent Karkheh (Arfaa et al. 1967). The final host of this worm is only humans and aquatic snail (*Bulinus truncatus*) act as intermediate host of the parasite (Chu et al. 1968). Climates, heat and adequate humidity provide a good condition for inhabit of the snail (Chu et al. 1966; Arfaa 2009).

People such as farmers and fishermen who have been in contact with fresh water to flow or people who are swimming in the traditional supply channels are susceptible to infection and disease because the infective form of the parasite release from the *Bulinus* snail and can enter the human body through skin and develop through the heart lung passage circulation and finally localize in vessels surrounding the bladder and the establishment of adult worms can cause vesical schistosomiasis (Maraghi et al. 2008).

Five decades ago the rate of infection in Khuzestan province was high and most of the students in the region

were infected with *Schistosoma haematobium* (Arfaa et al. 1967; Naghash 1980). The aim of this study was to investigate the process of dramatic reduction and the role of influencing factors in elimination the disease in Iran.

Methodology

This research was based on the literature and documented evidence related to the vesical schistosomiasis in Khuzestan province over the past five decades, including the situation of infection in past and present, the effect of environment, climate changes and biological factors on the prevalence of the disease in past and measures taken to reduce and finally eliminate the parasite and disease from this region.

Results and discussion

Figure 1 shows several foci of vesicle schistosomiasis in Iran (Khuzestan province) in the decade 60th. This disease, as reported by Arfa and colleagues (1967) consisted of six centers of infection in Khuzestan province including 2,500–3,000 patients in 170–200 villages and infected snails were widely dispersed in traditional irrigation canals, ponds and marshes, and agricultural land areas. High temperature, evaporation of water, relative humidity and environmental conditions are suitable for the snail and parasites to develop and more people, especially children were exposed to infection while they were swimming in contaminated water.

The campaign against vesical schistosomiasis in the province was started since 1958 in the city of Dezful with the aim of establishing anti- Bilharziasis (Schistosomiasis) station in Dezful city. The campaign did not cover all infected areas, because the infection was dispersed widely in the region. Preventive measures include screening and diagnosis of infected individuals, public health promotion, health education, drying swamps and ponds, improving the environment, cementing the canals and use of molluscicide to control the population of snails (Massoud et al. 1969, 1982). Hence, Schistosomiasis of the bladder which was 8.23 % in 1970, reduced to 0.7 in 1979. (Massoud et al. 1982).

In an epidemiological study by Naghash in 1980, 1901 urine sample collected from the people of 18 villages in the suburbs around Dezful, Susa, and Andimeshk, the rate of infection was 5.5 %. By continuous and intensifying preventive measures and climate changes caused by the drying up of marshes and ponds and cementing walls of channels, and the use of molluscicide, the population of snails reduced dramatically and it is predicted that the disease is eliminated in Khuzestan (Mombeini and Kheradmand 2005). Malawi and colleagues (2008) tested 3,400 urine

Fig. 1 The Situation of Vesical schistosomiasis in Khuzesta province in decade 60th (Naghsh 1980)

samples of students in Andimeshk superb and revealed no positive case of *Schistosoma haematobium* egg (Gholamreza et al. 2008). The results represented the elimination of the disease in the province, although pathology of vesical and fallopian tube biopsy specimens obtained from elderly people revealed vesical carcinoma and schisto-granuloma of the Fallopian tubes respectively (Ketabchi and Moshtaghi-Kashnian 2012; Maraghi et al. 2004).

Although the disease is eliminated from Khuzestan province and no case was reported within last 6 years, but the disease is still prevalent in neighboring Iran's western border country (Iraq) (Al-Kawaz 2007) and due to the special conditions of its facilities and the traffic between the two countries, it is necessary to consider measures to control and eradicate the disease in that country by using the experiences of Iran in eliminating the disease.

Acknowledgments This study is adapted from the M.Sc thesis of Mr. Dariush Hamidinia in Ahwaz Islamic Azad University. We would like to thank Farahnaz eazadpoor for his critical help in editing the manuscript. The authors express their acknowledge to Ahwaz Jundishapur University of Medical Sciences and have no conflict to declare.

References

- Al-Kawaz EWA (2007) Some biological and immunological aspects of *Schistosoma haematobium* infection. Ph.D Thesis, Baghdad University, Iraq
- Alaei Taleghani M (2009) Geo-morphology of Iran. Ghoms Press, Tehran (in Persian)
- Alijani B (2009) Iran climate. Payam Noor Press, Tehran (in Persian)
- Arfaa F (1972) Studies on schistosomiasis in the Yemen Arab Republic. Am J Trop Med Hyg 21:421–424
- Arfaa F (2009) Medical Helminthology. Khosravi Press, Tehran (in Persian)
- Arfaa F, Bijan H, Farahmandian I (1967) Present status of urinary bilharziasis in Iran. Trans R Soc Trop Med Hyg 61:358–367
- Ashtari F, Shariffard H, Shabankari M, Keykavousi A, Hashemifard A, Golafshan A et al (2012) Recognition of Khuzestan. Print and Distribution Company, Tehran (in Persian)
- Azar JE, Zurayf HC (1972) Present status of schistosomiasis in Lebanon. J Med 25:167–176
- Baquir H (1975) Epidemiology of bilharziasis in Iraq with special reference to bilharziasis population studies. Bull Endem Dis 16:71–81
- Chu KY, Massoud J, Sabbaghian H (1966) Host parasite relationship of *Bulinus truncatus* and *Schistosoma haematobium* in Iran: effect of water temperature on the ability of miracidia to infect B. Snails. Bull World Health Organ 34:131–133
- Chu KY, Massoud J, Arfaa F (1968) Distribution and ecology of *Bulinus truncatus* in Khuzestan. Iran. Bull World Health Organ 39:607–637
- Daneshbod Y, Oryan A, Davarmanesh M, Shirian S et al (2011) Clinical, histopathologic, and cytologic diagnosis of mucosal leishmaniasis and literature review. Arch Pathol Lab Med 135:478–482
- Gholamreza M, Jafar M, Allahbedasht M, Nikkhooy A, Mohammad KA, Rokni MB (2008) Survey of urinary schistosomiasis in Iran. Pak J Med Sci 24(6):857–860
- Jafarpour A (2011) Climate of the world. Payam Noor Press, Tehran (in Persian)
- Jedari Eivazi J (2010) Geo-morphology of Iran. Payam Noor Press, Tehran (in Persian)
- Ketabchi AA, Moshtaghi-Kashanian GR (2012) Urinary schistosomiasis with simultaneous cell carcinoma and transitional cell carcinoma. Iran J Parasitol. 7(3):96–98
- Maraghi S (2004) N Ranjbar N, Haddad, MHF. Schisto- granuloma of the fallopian tube from a low- endemic area in Iran. Acta Trop 92(1):89–90
- Maraghi S, Jelowdar A, Samie M (2008) Paramedical Parasitology. Vasef Lahigi Press, Qom (in Persian)
- Massoud J, Chu KY, Arfaa F (1969) Field trials of Bayluscide, sodium pentachlorophenate and copper sulphate in standing waters in Iran. Ann Trop Med Parasitol 63:189–194
- Massoud J, Arfaa F, Farahmandian I, Ardalan A, Mansoorian A (1982) A progress in the schistosomiasis control program of Iran. Bull World Health Organ. 60(4):577–582
- Mombeini H, Kheradmand A (2005) *Schistosoma haematobium* control in Khoozestan province in Iran: prosperities and failures. Med J Islam Repub Iran 19(1):19–22
- Naghsh AH (1980) Study the urinary schistosomiasis infection in Ajiroob region in Khuzestan Province. M.Sc Thesis in Parasitology, Jundishapur University (in Persian)
- Oryan A, Shirian S, Tabandeh MR, Hatam GR, Daneshbod Y (2013) Molecular, cytological, and immunocytochemical study and kDNA sequencing of laryngeal *Leishmania infantum* infection. Parasitol Res 112(4):1799–1804
- Shirian S, Oryan A, Hatam GR, Daneshbod Y (2012) Mixed mucosal leishmaniasis infection caused by *Leishmania tropica* and *Leishmania major* and brief literature review. J Clin Microbiol 50:3805–3808
- Shirian S, Oryan A, Hatam GR, Panahi S, Daneshbod Y (2014) Comparison of conventional, molecular, and immunohistochemical methods in diagnosis of typical and a typical cutaneous leishmaniasis. Arch Pathol Lab Med 138:235–240