ORIGINAL ARTICLE

A Historical Perspective on Piyuk Disease in Iran: An Analysis of Geographical Distribution, Diagnostic Methods, and Treatment Practices

Abstract

Environmental factors such as water, air, food, and drinks affect the health of the human body. Among these factors, water plays a fundamental role in human life. Any neglect of water hygiene and consumption of unhealthy water can cause the transmission of pathogenic agents to the body and disease occurrence. An example of a disease caused by the consumption of unhealthy water in the history of Iran is "Piyuk disease" (guinea worm). Therefore, the current research is trying to answer the following questions: Geographically, in which regions of Iran was Piyuk disease prevalent? What did Iranian doctors understand about this disease, and what preventive measures and treatment methods did they use to deal with it? The present research findings show that Piyuk was among the endemic diseases of the southern regions and in a limited form in some northeastern regions of Iran. The pathogen enters the human body through drinking unhealthy water. After a period of several months of incubation, it appears in the form of a skin rash and, finally, a worm-like rash. In the epistemological approach of mixed medicine, doctors have considered the increase and dominance of soda and phlegm in the body as the cause of disease. Following such a perception, doctors have prescribed various treatment methods to remove the thread from the body, including antidote treatment for the disease. Most of the treatments have been aimed at the swollen area. The present research is a historical study with a medical nature. The materials were collected using a library method and presented with a descriptive-analytical approach.

Key words: Iran, Medicine, Hygiene, Piyuk Disease, Prevention, Treatment

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Introduction

In general, the environment refers to a set of external factors and conditions and their effects on the survival of a living organism. Considering the constant interaction of humans with the environment, any disregard for its health can have adverse consequences for the individual and their social life. Environmental health refers to controlling all factors that harm the stability of human health. Human health is constantly threatened by environmental factors such as water, air, food, and many other factors.

The relationship between the environment and the disease can be discussed differently. The first point can be planned under the title of regional diseases, which aims to investigate and study the geographical distribution of diseases and their prevalence in different regions according to the environment. Another point is to examine the impact of various environmental and external factors, such as heat, cold, low and high altitude, air quality, food, and water, on the health and well-being of the human body. By referring to history, it is possible to identify examples of diseases that have spread in a certain geographical area. An important historical example of this type of disease can be identified under the name of piyuk. Unsuitable environmental conditions and lack of access to safe water and, as a result, the use of unhealthy and unsanitary water can lead to the occurrence of this disease.

Regarding the background of the research, the influence of environmental factors and their role in the formation of various diseases, including Piyuk, is a neglected topic in the field of medical history studies in Iran. In a thesis titled "*Study on Piyuk's disease and its fight in Iran*," which was done in the Faculty of Medicine of Tehran University of Medical Sciences, the new way of fighting this disease was investigated (Radpour, 1960). In another article titled "*Zahhak, snake on his shoulder and Piyuk parasite* (*Dracunculus medinensis*) *in Ferdowsi's Shahnameh*" (Jahanshahi Afshar, and Samimi, 2012, pp. 155-179), the authors have tried to show that the snakes on Zahhak's shoulder indicated that he was suffering from Piyuk disease; Drawing from this context, the present study aims to elucidate the geographical distribution and historical background of the disease while examining the cognitive and behavioral approach adopted by Iranian physicians within the framework of the mixed medical system.

Geographical Scope and a Brief History of the Piyuk Disease Outbreak

As with most diseases, very little information is available about the geographical extent of the outbreak and the history of Piyuk's disease. Some doctors, while pointing to the treatment methods of the disease, have also pointed to its geographical distribution. Historical sources, especially local histories, provide relatively good information about the history and treatment methods of the disease in the region in question. Also, western tourists, in their travelogues, have mentioned the regions and cities where this disease has spread. In most of these reports, the outbreak of this disease is mentioned in the southern areas of Iran and the coasts of the Persian Gulf. A few reports have also mentioned the spread of the disease in the northeastern regions of Iran.

According to the available information, the main focus of the outbreak of this disease was the southern regions of Iran. Historical records from various periods have documented the widespread occurrence of this disease in the Khuzestan region (Avicenna, 2010, p. 394; Baha al-Dooleh Razi, 2008, p. 327), in the shores of the Persian Gulf in Hormuz Island (Baha al-Dooleh Razi, 2008, p. 327), Bandar Abbas or "*Gambron*" (Lockhart, 2004, pp. 327-328; Kempfer, 1977, pp. 524-535; Vambery, 2008, p. 246; Pollack, 1989, p. 481) and

Bushehr (Dieulafoy, 1999, pp. 593-594; Saadat Kazroni, 2011, p. 22; Afshar, 2001, pp. 569-570; De Windt, 1891, p. 216; Brugesh, 1989, pp. 466-467; Najm al-Douleh, 2007, pp. 110-111).

Other reports have mentioned the outbreak of the disease in Fars province and the cities of Shiraz (Farman Farma, 2001, pp. 63-64; *Vagayeh Ettefagieh*, 2004, p. 246) and Lar (Baha al-Dooleh Razi, 2008, p. 327; Hakim Momin, 2011, p. 263; Mohammad Mirak bin Masoud Hosseini Monshi, 2006, p. 45; Pollack, 1989, p. 481).

In addition to the southern regions, the spread of this disease has also been mentioned in the northeastern regions of Iran. According to Jurjani, the disease was prevalent in Khorasan during his time, as documented in his writings from that period (Jorjani, 2012, Vol. 2, pp. 188-189). Also, the outbreak of this disease has been mentioned in the cities of Merv, Nasa (Qazvini, 1994, pp. 530-531, 540) and Bukhara (Ein ol-Saltana, 1995, p. 1720) (Vambery, 2008, p. 246). In Mero, this disease affects people every year. The disease outbreak in Shirghan Qochan area has also been mentioned (Baha al-Dooleh Razi, 2008, p. 327).

Piyuk's disease is one of the diseases mentioned in various literary sources. For example, Shahnameh alludes to the disease by describing snakes growing on Zahhak's shoulders (Jahanshahi Afshar, and Samimi, 2012, pp. 155-179). This indicates that he suffered from Piyuk disease. In Boostan and one of his anecdotes, Saadi mentions a king afflicted with this disease, though he does not specify the king's name (Saadi Shirazi, 1993, pp. 245-246).

Etiology/Recognition of the Pathogen

At the beginning of the discussion, it is necessary to mention the modern medical prevention and treatment methods for Dracontiasis, also known as guinea worm disease, along with the definition of Piyuk's disease. Dracontiasis is a tropical disease caused by the presence of the parasitic tapeworm "*Dracon colossus medinensis*" in the subcutaneous tissues, and its female worm can grow up to 60-120 cm in length and resides in the connective tissues under the skin. This worm has a larval stage in a microscopic crustacean (cyclops) that lives in freshwater. This parasite enters the human body by drinking contaminated and unhealthy drinking water. The pathogens enter the body through ingestion and proceed to infect the individual via the gastrointestinal tract over the course of several months. Preventative measures for Dracontiasis primarily focus on avoiding the consumption of contaminated water. Research indicates that chemical treatments, such as chlorination, are effective in disinfecting water and preventing the transmission of parasites. The initial symptoms of Dracontiasis typically appear around a year after the infection, as the worm migrates towards the skin surface. These symptoms may include itching, dizziness, difficulty breathing, diarrhea, and vomiting. The endpoint of the disease is the formation of a blister and a significant swelling on the skin of the leg or arm, which becomes injured and infected when it bursts. The treatment requires killing the adult worms by injecting phenol thiazine. The treatment of the disease involves the administration of anthelmintic drugs such as Thiabendazole. It is recommended to be taken twice a day for three days in the case of Piyuk disease (Jahanshahi Afshar, and Samimi, 2012, pp. 165-165; Nabipour, 2007, p. 98; Mountjoy, 1942, pp. 291-301).

Iranian doctors' cognitive and behavioral approach was carried out within the frame-

work of the mixed medicine system before the introduction of modern medicine. Pathogenic factors in this approach are categorized into internal and external factors. External and environmental factors play an essential role in the occurrence of various diseases and physical ailments upon entering the body. Among the environmental factors, the neglect of drinking water hygiene was recognized as a critical issue. While water has played a vital role in human life, it is not always possible to access safe water. Weather conditions and insufficient rainfall made people, especially in southern Iran, store rainwater in reservoirs for their annual water supply. Water stagnation for a long time led to the creation of all kinds of parasites and, as a result, water pollution. The consumption of contaminated water facilitated the transmission of parasites into the human body, resulting in the spread of diseases. This issue was particularly prevalent in southern Iran. In medical literature, this parasitic disease is referenced under various names. The most common Arabic term for the parasite is "*Al-Erq al-Madani*" or "*Erq Madani*." The spread of this disease in the Arabian Peninsula and the city of Madinah and the fact that a large number of people in this city were affected by this disease made this disease notorious (Avicenna, 2010, p. 394; Jorjani, 2012, Vol. 2, p. 196; Jorjani, 1990, p. 111; Shah Arzani, 2008, p. 1148; Kempfer, 1977, p. 525). Maqdisi, one of the geographers of the Islamic period, attributed the existence of a plant in Madinah as the cause of this disease (Maqdisi, 1982, p. 143). In the Persian language, this parasite or disease has been referred to by titles such as Reshteh, Piyuk and Piu [in Lari language] (Jorjani, 1990, p. 111; Saadi Shirazi, 1993, pp. 245-246; Baha al-Dooleh Razi, 2008, pp. 327, 357; Hakim Momin, 2011, p. 263; Shah Arzani, 2001, p. 761). In the Indian language, this parasite is called Naru (Younani, 2004, p. 42; Aqili Alawi Shirazi, 1859, Vol. 1, p. 761).

Water plays a dual role in the emergence and transmission of diseases. It can serve as a breeding ground for pathogenic agents and a conduit for transferring them to other organisms, including humans. Diseases are transmitted through different kinds of parasites, bacteria, and viruses that thrive in contaminated water and enter the body upon consumption, causing disease. A notable example of such a disease in Iran's history is Piyuk disease. Regarding the type of disease transmission, doctors were aware that the pathogen was transmitted to the human body by drinking contaminated water, such as stagnant, heavy, bloated, rotten, and thick water. The pathogen contributed to changing the taste of water in ponds and reservoirs (Hakim Momin, 2011, p. 263; Aqili Alawi Shirazi, 2006, pp. 457-458; Aqili Alawi Shirazi, 1844, pp. 802-803; Aqili Alawi Shirazi, 1859, Vol. 1, p. 544; Lockhart, 2004, pp. 327-328; Mohammad Mirak bin Masoud Hosseini Monshi, 2006, p. 45; Pollack, 1989: p. 481). Some doctors reported their experience and clinical observations about this issue: "*And I witnessed some individuals consuming those waters and, after some time, getting Piyuk. Moreover, the inhabitants of Shirghan have experienced this disease due to drinking stagnant water contaminated by rotting leaves from surrounding trees*" (Baha al-Dooleh Razi, 2008, p. 327).

Historical accounts unequivocally point to the role of contaminated water, particularly water stored in reservoirs (as shown in Figure 1), in the spread of Piyuk disease and the transmission of pathogens to humans.

Due to a shortage of rainfall in the city of Lar, the only source of drinking water was rainwater collected and stored in reservoirs. The stagnant water often emits a strong, unpleasant odor and appears cloudy. Despite attempts to filter the water through a fine cloth and boil it, small particles or worm eggs could still be observed. Consuming this foul-

smelling water was found to lead to the presence of a long worm in the knees and legs, known as the "*thread*." (Mohammad Mirak bin Masoud Hosseini Monshi, 2006, p. 418; De Windt, 1891, p. 216; *Dar Sanate Khelgate Adami va Amraz va Moalejat Anha va Adviye*, 1850, p. 52). There are accounts of Piyuk disease in the city of Bushehr due to the consumption of unhealthy water from reservoirs, especially public reservoirs. (De Windt, 1891, p. 216; Brugesh, 1989, pp. 466-467; Najm al-Douleh, 2007, pp. 110-111; Sadid al-Saltaneh, 1963, pp. 602-603; Saadat Kazroni, 2011, p. 254; Abbas Mirza Qajar, 1946: 112; Dieulafoy, 1999, p. 584; Khirandish, and Kavoosi, 2016, pp. 208-209; Floor, 2008, p. 50). Diolafowa's report confirms the role of unhealthy water in the prevalence of disease among the poor: "*European residents and wealthy individuals in Bushehr avoided using local water, protecting them from the associated health risks. Instead, they had safe drinking water transported from Basra or Mohamrah on double-decker boats. However, less fortunate individuals had no choice but to consume the contaminated local water, leaving them afflicted by waterborne diseases for much of their lives*." (Dieulafoy, 1999, p. 594). These reports show that doctors and the general public were aware of the transmission of the pathogen to the human body through water. However, there was no governmental support, and they did not have the necessary knowledge for de-parasitization or disinfection. This issue was taken care of during the first Pahlavi period. As insufficient efforts were made to improve water sanitation and disinfection during the Qajar dynasty, the disease persisted and continued to spread along the Persian Gulf coast, affecting Bushehr and its surrounding areas. The first Pahlavi period took measures to eradicate this disease and disinfect the ponds. The authorities advised people to avoid consuming stagnant water in ponds. (Manuscript No. 3105/18917, n.d.; *Request to prevent the spread of Piyuk disease in Larestan*, 1936). Despite introducing measures to mitigate the disease, the long-lasting impacts continued to affect the inhabitants of the afflicted regions for many years to come. (Khirandish, and Kavoosi, 2016, pp. 208-209).

Figure 1. Exterior View of the Water Reservoir (*Nabipour, 2007, p. 98*)

Symptoms of Piyuk's Disease and Methods of Treatment

There was a possibility of disease in different parts of the body. The most involved part was the lower leg. However, there was a possibility of the disease occurring in the wrists, arms, and thighs, and sometimes in children, especially boys, in the side (Razi, 2008, p. 382; Majosi, 2008, Vol. 3, p. 327; Aqili Alawi Shirazi, 2006, pp. 457-458; Shah Arzani,

2008, p. 1148; Hosseini, 1569, p. 406) Avicenna's observation highlights the prevalence of the condition in children, emphasizing that it is not limited to the lower limbs: "*Mostly this boil-like rash appears on both legs and I myself have seen that. It is found both on hands and the side. Children often have such a rash on their sides*" (Avicenna, 2010, p. 393).

The disease started with the emergence of seed-like, blister-like, or pimple-like lesions on the skin. Over time, these lesions matured and turned into a watery blister. In the next step, when the blister was punctured, a thin and long thing in the shape of a worm with a purulent reddish-black color and about a meter or more in length came out through the opening. In addition, the affected individuals often experienced a sensation of movement beneath the skin akin to that of a worm or snake. Other accompanying symptoms included severe burning, inflammation, fever, itching, and intense pain in the area surrounding the blisters. These complications collectively compounded the distress and discomfort experienced by those afflicted. (Razi, 2001, p. 523; Avicenna, 2010, p. 393; Majosi, 2008, Vol. 2, p. 303; Sajzi, 2008, p. 73; Baha al-Dooleh Razi, 2008, pp. 327, 357; Vambery, 2008, p. 246; Shah Arzani, 2008, p. 1148; Heravi, 2008, p. 266; Tony, 1561, p. 229; Hosseini, 1569, p. 406; Aqili Alawi Shirazi, 1859, Vol. 1, p. 544).

Following the epistemological approach of mixed medicine, physicians attributed the cause of Piyuk 's disease to the imbalance of the mixture, "*dryness of temperament," and "increase of waste materials and impurities such as warm soda blood and burnt phlegm*." Based on this perception, they provided measures and recommendations following the essential principles for individuals at risk or already afflicted by the disease. The patients were recommended to reduce their physical activities and rest more when inflammation and blisters appear, signaling the onset of Piyuk's disease. Since this disease occurred less in bodies with high humidity, it was essential to avoid foods that could dry out the body, such as certain fruits, vegetables, and sweet or salty meats. To help maintain or increase bodily moisture, doctors recommended consuming moist and delicate foods, as well as meats with moderate characteristics, such as lamb, half-meated chickpea broth, peeled mung beans, and chopped green garlic or dry beef meatballs. (Razi, 2001, p. 524; Razi, 2008, p. 382; Avicenna, 2010, pp. 393-394; Majosi, 2008, Vol. 2, p. 303, Vol. 3, p. 327; Shah Arzani, 2008, p. 1148; Baha al-Dooleh Razi, 2008, p. 327; Tony, 1561, p. 229; Yousefi Heravi, 2003, p. 129).

Several methods were practiced to enhance bodily hydration. These included consuming substantial amounts of water, frequent bathing and washing, and applying oil to the skin. Continuous drinking of seawater, especially fresh seawater, was considered beneficial and highly recommended for quick blistering and the coming out of carmine (Razi, 2001, p. 524; Razi, 2008, p. 382; Avicenna, 2010, p. 394; Majosi, 2008, Vol. 3, p. 327; Baha al-Dooleh Razi, 2008, p. 327; Shah Arzani, 2008, p. 1148; Yousefi Heravi, 2003, p. 130). Bathing in sulfur water was regarded as one of the most advantageous practices due to its therapeutic properties. Bathing with the soothing properties of this water was considered beneficial and recommended for most skin diseases, especially acne (Mohammad ibn Abdullah, 2004, p. 140; Aqili Alawi Shirazi, 1844, p. 731).

Guided by the etiology of the disease, healthcare providers employed an array of techniques to cleanse and eliminate waste materials and toxins from the body. The specific treatment approach was determined based on the individual's health condition, inflamma-

tion levels, and feverish state. To accomplish this, bloodletting techniques were performed either by opening the basilic and saphenous veins on the opposite side of the affected limb or through the application of leech on the inflamed area. Following bloodletting, various types of soda and phlegm laxatives were administered to alleviate constipation and mitigate dry mood. These remedies included Terminalia chebula syrup, yellow myrobalan, Boild Terminalia chebula, a pill of al-sannib's gum with a mixture of Terminalia chebula and Senna and Fumaria officinalis (shahtera), Cuscuta Epithymum and The pill of Habb-e-Quqayya which was beneficial and recommended (Majosi, 2008, Vol. 3, p. 327; Razi, 2001, p. 524; Avicenna, 2010, p. 394; Shah Arzani, 2008, p. 1148; Yousefi Heravi, 2003, p. 129; Shah Arzani, 2001, p. 210; Baha al-Dooleh Razi, 2008, p. 327; Majosi, 2008, Vol. 3, p. 327; Razi, 2001, p. 524; Shah Arzani, 2001, p. 210; Tony, 1561, p. 229; Hosseini, 1569, p. 406).

One of the most useful and unique medicines for cleansing and removing soda and phlegm from the body was the "*Aloe vera*" plant. In case of swelling, the patient should use a herbal mixture (Purified aloe vera/Neqi Sabr) in chicory water for three consecutive days. The way to use the medicine was to drink half a dram on the first day, one dram on the second day, and one and a half dram on the third day, which had been soaked in chicory water the night before. Physicians believed that following this multifaceted therapeutic approach in taking this medicine would contribute to effectively eliminating the disease. (Razi, 1998, p. 134; Razi, 2001, p. 524; Razi, 2008, p. 382; Avicenna, 2010, pp. 394-395; Majosi, 2008, Vol. 3, p. 327; Hosseini, 1569, p. 406; Shah Arzani, 2001, p. 210; Shah Arzani, 2008, p. 1148).

Another valuable medicinal approach involved using potions, which are complex combinations of herbal medicines. Consistent use of these preparations over a period of ten to twenty days was believed to effectively eliminate the disease-causing substance and prevent further outbreaks. The most frequent example of this type of combination was made from Terminalia chebula (Halileh Kabuli), Terminalia bellirica (Belileh), Amla Mokhshir, Raphanus sativus var. longipinnatus (White Tarbad), Ginger, and Mallotus (Qanbil), which should be fried and greased in cow or almond oil and seasoned with sugar and sweets or white honey or Sanjari faniz. And then it was used as a syrup for two to three drams (Jorjani, 2012, Vol. 10, p. 463; Jorjani, 1966, p. 664; Chaghmini, 2010, pp. 319-320; Shafaei Isfahani, 2014, p. 22; Shah Arzani, 2008, p. 1149; Aqili Alawi Shirazi, 1859, Vol. 1, p. 761; Aqili Alawi Shirazi, 1859, Vol. 2, p. 1140; Qaini Heravi, 1867, p. 18).

If the disease did not resolve with the general cleansing of the body and recurred at this stage, the focus shifted to treating inflammation at the swollen site and promoting the maturation and removal of the blister. For this purpose, using anointment on the swelling area with flower oil and the use of cold/wetter bandages and ointments, such as "*slimy and sticky moisture of Aloe vera*," "*Yemenian chickpeas rubbed in water*" and combinations of "*Aloe vera* (*L.*), *coriander water, water*" Chicory leaves, "*Sandal and camphor mixed*," "*Esbgul*, *vinegar*, *rose water*," "*Esbgul*, *rose water*, *milk*," "*Myrrh*, *asparagus*, *milk*," "*Myrtle eggs with vinegar and rose water*" were recommended. (Razi, 2008, p. 382; Razi, 2001, p. 524; Razi, 1998, p. 134; Majosi, 2008, Vol. 3, p. 327; Avicenna, 2010, p. 394; Baha al-Dooleh Razi, 2008, pp. 327-328; Shah Arzani 2008, vol. 2, p. 1148; Shah Arzani, 2001, p. 210; Aqili Alawi Shirazi, 1859, Vol. 2, pp. 1045-1046; Aqili Alawi Shirazi, 1844, pp. 231-232).

After finding the piyuk's head, the resulting amount was recommended to be wrapped gently around a piece of lead weighing about a dram. The heaviness of the piece made Payuk slowly leave the body. To reduce inflammation and increase the softness of the swollen part and for the easy removal of the pus from the body, gently rub the part with salt, anointing with softening and cooling medicated oils such as flower, cheiri, iris, ban, almond, pumpkin, and cow oil. If combined with garlic, it would be more helpful. Warming up the member (Takmid) with hot water or pouring and sprinkling hot water on the member increases the humidity and makes the pus come out easily. Another solution was to use various bandages. The poultice of the combination of "*Esbghul and almond oil*" or the combination of "*castor tree leaves with sesame oil*" and Khorasan Levisticum officinale gum or Ferula assa-foetida on the boil would increase the softness of the organ and make it easier to remove the thread from the body. (Razi, 2001, pp. 524-525; Razi, 1998, p. 134; Razi, 2008, p. 382; Avicenna, 2010, pp. 395-396; Majosi, 2008, Vol. 3, p. 327; Jorjani, 2012, Vol. 3, pp. 436 -437; Baha al-Dooleh Razi, 2008, pp. 327-328; Shah Arzani, 2008, p. 1149; Heravi, 2008, p. 35; Yousefi Heravi, 2003, p. 130; Younani, 2004, p. 43; Afshar, 2001, pp. 569-570).

It was necessary to completely remove the Piyuk from the body so that the wound was not closed. The example of the suggested medicinal composition is as follows: "*And four shekels of goat fat, three cloves of green garlic, or one shekel of dried garlic, separately ground and mixed together, and applied to the wound site to prevent the wound from becoming more inflamed than the entire thread comes out*." (Yousefi Heravi, 2003, p. 130). Tolerance was necessary for this disease. It was necessary to act slowly and gently when pulling out the Piyuk and to be careful not to cut it in any way because if it were cut, the Piyuk would sink into the body and cause infection, swelling, and appearance of theards. In this case, the patient had to be hospitalized for at least one week and had to endure severe pain. To alleviate pain during this period, it was advised to consistently submerge the affected area in cold water or seawater. Additionally, gold, recognized for its absorbent properties, was used to encourage Piyuk regrowth. Continuous application of compounds such as Ester poison burnt with yogurt or half a weight of burnt buffalo horn proved beneficial in providing relief and reducing pain. (Razi, 2008, p. 382; Avicenna, 2010, p. 393; Baha al-Dooleh Razi, 2008, p. 327; Yousefi Heravi, 2003, p. 130; Hervey, 2008, p. 110; Vambery, 2008, p. 246; Sadid al-Saltaneh, 1963, pp. 600-602; Aqili Alawi Shirazi, 1859, Vol. 2, pp. 1045-1046; Afshar, 2001, pp. 569-570). In order to reduce inflammation and pain, it is beneficial and recommended to put an ointment composed of "*dead stone, reed ash, saffron, and flower oil*" on the place where the worm comes out (*Dar Sanate Khelgate Adami va Amraz va Moalejat Anha va Adviye*, 1850, p. 52). To relieve the pain caused by the tearing of Thread (civil sweat or Madani sweat), it is useful and recommended to apply a bandage made from the combination of cooked meatballs, mung bean flour, Turmeric, chicken waste, cooked onion, cooked eggplant kernels, and lamp oil. These ingredients were cooked together and applied to the affected area as a poultice. (Aqili Alawi Shirazi, 1859, Vol. 2, p. 1077).

If the Piyuk ruptured and there was no obstruction, it is recommended to open the extension of the swelling area and remove the worm. This task was often carried out by Salamanis (barbers) or Dallakan (staff members in Hamam), who were popular and accessible healers with specialized skills in splitting the skin and removing the piyuk, and they often

did this work. Their working method was that as soon as the Piyuk was felt, they would split the skin and take out the Piyuk. The procedure had a good chance of success before skin blistering because, after that, the piyuk would enter the flesh and would no longer be visible. After finishing, some clay should be immediately put on the hole from which the thread came out so that air does not enter the site. If the Piyuk worm was torn while taking it out, the remaining portion would be hidden beneath the flesh, causing swelling at the affected site. (Sadid al-Saltaneh, 1963, pp. 600-602; Afshar, 2001, pp. 569-570). The doctors used the root of the pomegranate tree to extract the worm. In addition, in popular belief, using Herati Anghuzeh, lamp soot, Indian feathers, and Kabuli rice was beneficial for getting rid of this worm. They are usually found in perfume shops (Pollack, 1989, p. 425). The use of hot and spicy medicines to remove the worm was prohibited due to the possibility of acne. Using a Qanbil potion (an anthelmintic plant) as a drink or gold is beneficial and recommended at this stage. To address any remaining Piyuk, creating a local infection by applying animal fat to the incision site was advised, promoting the decomposition and removal of the remaining Piyuk from the affected area. To heal the wound, it was necessary to use tissue-regenerative medications. In the composition of the ointment samples ordered for this purpose, beeswax, sandstone, reed ash, lime, flower oil, basil, and violet oil were used. (Razi, 2008, p. 382; Razi, 1998, p. 134; Avicenna, 2010, pp. 393-396; Majosi, 2008, Vol. 3, p. 328; Shah Arzani, 2001, p. 210; Shah Arzani, 2008, p. 1149; Aqili Alawi Shirazi, 1844, pp. 713-714).

Based on the available information, Piyuk disease typically exhibited a latency period before the onset of visible symptoms, primarily characterized by blisters on the legs. Treatment for Piyuk was often protracted due to the complex nature of the associated complications, frequently leading to a decline in physical strength and overall health. The resulting decrease in physical strength and immunity made individuals more vulnerable to various other illnesses. However, as public awareness increased and government initiatives were implemented to improve water sanitation in high-risk areas, the number of infections began to decline. Furthermore, advancements in modern medicine led to the introduction of tablet and ampoule-based treatments, which demonstrated effective results and significantly expedited the recovery process, allowing patients to regain their health within a shorter period.

Conclusion

Environmental factors like water, air, food, and beverages play a critical role in sustaining human life. Yet, they can also contribute to the onset and transmission of various diseases. Access to healthy water is essential for maintaining proper bodily function, and disregarding its importance can lead to multiple health concerns. A prime example of an illness caused by consuming contaminated water in Iran's southern and northeastern regions is Piyuk disease. Due to unfavorable environmental conditions, inadequate rainfall, and limited access to safe water, residents in these areas often relied on unhealthy water sources, which facilitated disease transmission.

Piyuk disease manifested as a worm-like entity, typically appearing in the legs. Due to its extended incubation period, preventive measures were limited. However, once the disease manifested, various treatment methods were utilized to manage the symptoms and eradicate the worm from the body. Most of these treatments aimed to address the swelling

and inflammation caused by the worm, ultimately facilitating its gradual removal from the body.

Authors' Contribution

Javad Alipour Silab and Mohammad Bakhtiari collaboratively conceived the idea for the re-view. Javad Alipour Silab conducted the initial literature review and drafted the manuscript. Mohammad Bakhtiari provided critical revisions, added key insights, and contributed to the analysis and interpretation of the data. Both authors contributed equally to refining the manuscript and addressing reviewer feedback. Both authors read and approved the final version of the paper.

Conflict of Interest

None.

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