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## History of Contemporary Medicine

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### A Brief History of Smallpox Eradication in Iran

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#### Abstract

Smallpox, which currently is only of historical interest, was once one of the most terrible illnesses with high mortality and morbidity. In the late 18<sup>th</sup> century, the English physician and naturalist, Edward Jenner (1749 – 1823), discovered an efficient preventive technique against smallpox which he termed “vaccination”. Afterwards, the practice of vaccination gradually became widespread when finally in 1979, the World Health Organization formally declared the global eradication of this fatal disease.

Presented here is a brief account of smallpox eradication in Iran which started on a limited scale in the 19<sup>th</sup> century by the order of Abbas Mirza (1789 – 1833), the Crown Prince of Fath Ali Shah Qajar (reign from 1797 – 1834), and reinforced in 1848 by Mirza Taghi Khan Amir Kabir (1807 – 1852) the Prime Minister of Naser ad-Din Shah, and became more popular after the establishment of the Pasteur Institute in Tehran in 1921, where considerable doses of smallpox vaccine were produced. In addition, in subsequent years, a law that mandated public smallpox vaccination was passed by the Iranian parliament (Majles) in 1953 and eventually, the mass vaccination program led to the complete eradication of smallpox in Iran in 1978.

**Keywords:** Iran • smallpox • vaccination

#### Introduction

Smallpox was a fatal contagious viral disease called by some authors as “the most terrible of the ministers of death”.<sup>1</sup> It was a major cause of morbidity that included deep pitted skin scars and blindness. Historically, smallpox dates to the prehistoric era, i.e. 3000 to 6000 years ago.<sup>2</sup> In the Middle East and Iran it was a common disease from ancient times.<sup>3</sup> The origin of smallpox was uncertain, but it has been postulated that it originated from Africa and then

spread to India by Egyptian merchants.<sup>1</sup> The mortality and morbidity rate of smallpox was high, especially in children, and it has been estimated that at the end of eighteenth century in Europe smallpox annually killed 400,000 people and was responsible for more than one-third of all cases of blindness.<sup>4</sup> In the nineteenth and twentieth centuries, the mortality of smallpox remained high. For example, in an outbreak in Montréal-Canada in 1885, 3000 people died of smallpox.<sup>5</sup>

#### The worldwide smallpox campaign

Smallpox has been known as a dreaded disease since antiquity. So, in ancient China, special methods were used to prevent it. The ancient Chinese were also aware of the accurate clinical picture of the disease as well as the relationship between contracting cowpox and the resultant immunity to smallpox. In Africa, some tribes injected the pus of smallpox vesicles directly under the skin and in some parts of Asia, the dried crusts of the vesicles, were dissolved in water and injected under the skin of healthy individuals for prevention. In India, a physician who lived around 550 C.E. described the method of inoculation of the material taken from the udder of a cow infected by cowpox into the arm of a healthy person in order to prevent a future smallpox infection.<sup>6</sup> For centuries, the Iranians were also familiar with smallpox. For instance, the renowned Iranian physician Mohammad Zakariyay-e-Razi (865 – 925 C.E.) who was called Rhazes in the West, gave an accurate description of smallpox and measles in Arabic (*al-Judri wa al-Hasbeh*) during the Middle Ages. This description was later translated into Latin and then reprinted many times in Europe until the 17<sup>th</sup> century (Figure 1).<sup>7</sup>

A preventive smallpox technique was also commonly practiced for an extended period of time, especially in Baluchestan Province in southeastern Iran.<sup>8</sup>

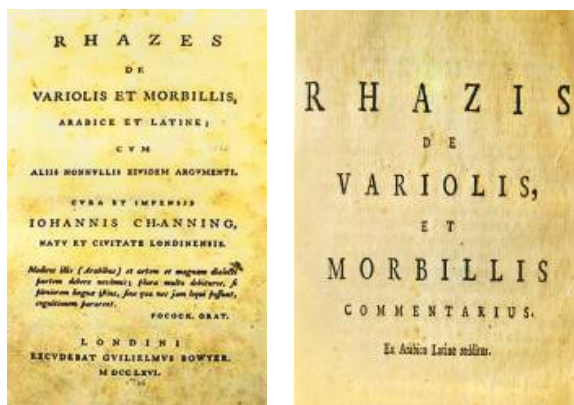
The introduction of a new smallpox vaccination

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**Figure 1.** Two Latin versions of Rhazes' Treatise on Smallpox and Measles (Source: Academy of Medical Sciences of I.R. Iran. *Selected Pictures on History of Medicine in Islam and Iran*; 2008: 238 – 239)

procedure in the late eighteenth century was a great triumph for medicine. The credit for this modern smallpox vaccination has been given to Dr. Edward Jenner (1749 – 1823), the English physician and naturalist. He observed that milkmaids who had contracted the mild pustular eruptions of cowpox from infected cows considered themselves immune. Therefore, he inoculated an eight year-old boy, named James Phipps with cowpox in 1798 and called the procedure vaccination (derived from the Latin term *vaccinia* meaning cowpox) (Figure 2).<sup>9</sup>

After six weeks, Jenner inoculated the same boy with fluid from an active smallpox vesicle, but Phipps did not show any signs of smallpox. Thus Jenner tried the same technique on 23 more persons before he finally published the results of his experiment. This empirical observation was accepted<sup>9</sup> and by 1800, approximately 100,000 people had been vaccinated in Europe. Later, in 1864, the smallpox vaccination became mandatory in England and Wales and mass production of the



**Figure 2.** A painting showing Jenner vaccinating James Phipps, 1798 (Available from: URL: <http://ebinrushed.com>)

smallpox vaccine was initiated. The vaccination rate subsequently increased significantly in developed countries. Accordingly, by 1900, smallpox vaccination was mandatory in most European countries. In 1967, the World Health Organization (WHO) planned an international program against smallpox through vaccination and case tracking. Finally, the last case of smallpox was reported from Somalia in a young man and in 1979, WHO officially declared the worldwide eradication of smallpox after international and locally organized efforts (Figure 3).<sup>5</sup>



**Figure 3.** Global eradication of smallpox

### The Iranian battle against smallpox

Public health facilities were very poor during the Qajar period (1796 – 1925) and in the 19<sup>th</sup> century, Iran was still subject to outbreaks of various fatal diseases including smallpox. The history of smallpox vaccination in Iran dates to the reign of Fath Ali Shah Qajar (1797 – 1834), when the British doctor John Cormick, the personal physician to Crown Prince Abbas Mirza (1789 – 1833), wrote a treatise on smallpox inoculation. According to Keddie, “Abbas Mirza, the governor of Azarbaijan, was the only Qajar with power who understood the urgent need for Western-style reforms”.<sup>10</sup> Cormick's book was translated into Persian and published at the first printing house established by Abbas Mirza in Tabriz, Azarbaijan Province. It has been said that the treatise on smallpox inoculation was the first modern medical book published in Iran (Figure 4).<sup>11</sup>

Dr. Cormick vaccinated the family of Abbas Mirza against smallpox as well as some people in the villages of Azarbaijan Province, however, this stopped due to public opposition.<sup>9</sup> The older brother of Abbas Mirza, Mohammad Ali Mirza Doulatshah, was the ruler of Kermanshah Province



**Figure 4.** Persian translation of Dr. Cormick's Treatise on Smallpox (Source: Tadjbakhsh H, *History of Veterinary Medicine and Medicine in Iran*. Vol. 2, Tehran: Tehran University Press; 2002)

in western Iran. He ordered mandatory vaccinations, mainly for children. Moradian, an Armenian from Istanbul who lived Iran between 1815 and 1821 and was employed as the translator for Kermanshah's ruler, began public vaccinations. After the death of the ruler of Kermanshah, Moradian went to Tehran, Isfahan, Hamadan, Kashan, and Julfa where he continued the smallpox vaccination program.<sup>11</sup>

Later, during Naser ad-Din Shah (reigned 1848 – 1896) who was the fourth king of the Qajar dynasty, medical books including one on smallpox were written by a French physician, Dr. Joseph Desire Tholozan (1820 – 1897), special physician to the Shah. These books were translated into Persian.<sup>8</sup> In 1848, the public smallpox vaccination became mandatory by the order of Mirza Taghi Khan Amir Kabir (1807 – 1852), the reform-minded Prime Minister of Naser ad-Din Shah. In this regard, the Austrian medical teacher of the Dar al-Fonun School in Tehran, Dr. Jacob Eduard Polak (1818 – 1891), wrote that “as Amir Kabir was concerned with the health of citizens, he made efforts to prevent smallpox by vaccination and dispatching caregivers throughout the provinces with adequate means and ordered the translation and republication of the treatise on smallpox into Persian.” Dr. Polak also added that “at that time, most children in Tehran were vaccinated against smallpox”. Based on the official newspaper of the government at that time, *Waghaye Etfaghyeh* (established in 1848), Amir Kabir ordered the health officers to perform smallpox vaccinations and they were dispatched to the provinces of Iran. The vaccination program was not initially accepted by the community, but gradually became popular

and many children in Tehran, Rasht, Yazd, and other major cities were vaccinated against smallpox. The parents of children who were not vaccinated were fined by the government.<sup>12</sup> Unfortunately, after the death of Amir Kabir in 1851, most of his health programs were suspended or became ineffective and as W. Floor has written, the officials did not consider smallpox to be a major public health threat. Therefore, they were not interested in the official vaccination program even though the smallpox vaccine was available at that time. However, some efforts were made and sporadic vaccinations were carried out. For instance, in 1859, physicians at the British Embassy in Tehran decided to vaccinate the children and it was initially successful, but was stopped due to public protest and lack of official support. At the end of the 1850s, a European physician named Dr. Hans began a vaccination program in Gilan Province near the Caspian Sea in northern Iran, but it was also stopped. Later, in 1870 the ruler of Gilan Province, Asef ad-Dowleh, ordered the smallpox vaccination program to continue. Despite these irregular vaccinations, smallpox outbreaks commonly occurred in Iran. For example, in 1871 – 1872, several epidemics of smallpox occurred in southern Iran.<sup>8</sup>

The establishment of the Council for Preservation of Health (*Majles Hefz-o-Sehheh*) in 1881 was a turning point in the propagation of modern public health measures in Iran and in the 1880s; most major cities in Iran had a branch of the council.<sup>13</sup> Under the auspices of the Ministry of the Interior, the council became the main public health authority and dispatched health officers (named *Hafez a-Sehheh*) to major Iranian cities to promote public health, including performing smallpox vaccinations. However, smallpox eradication was not totally successful and in 1887, in Isfahan, 760 cases of smallpox were reported and only 30 patients survived. Thus, in 1880, Naser ad-Din Shah ordered Etezzad a-Saltaneh, the Minister of Education, to make the smallpox vaccination mandatory, but it never became practical. The Council for Preservation of Health was re-established in 1904 which replaced the earlier council. Its activities continued until 1920 with the gradual appointment of 48 health officers in a number of towns. Again between 1898 and 1903, a smallpox outbreak occurred in Khuzestan Province in southeastern Iran and again in 1906 in Khorasan.<sup>8</sup> Thus, in 1906, a law was passed by the



parliament (Majles) to control contagious diseases which included smallpox and in 1910, a budget was devoted by the parliament to the smallpox vaccination program as well as for the preparation of an anti-diphtheria serum.<sup>14</sup> Eventually, during the reign of Ahmad Shah Qajar (reigned 1909 – 1925), the Council for Preservation of Health was transformed into the Ministry of Health and Charity Affairs (Vezerat-e Sehhyeh va Omure-Kheiryyeh) in 1920 and the battle against smallpox continued. In addition, during the final years of the Qajar dynasty, the Pasteur Institute in Iran was inaugurated on August 24, 1921 in Tehran.<sup>15</sup> According to a report from the Public Health Department of the League of Nations, June-September 1924; in 1924 more than 193,000 smallpox vaccines were manufactured at this institute and the rate of smallpox vaccination administered to the population increased from 44.6% to 75.6%.<sup>16</sup> The smallpox vaccine production at the Pasteur Institute of Iran reached five million doses in 1928. After WWII, the annual smallpox vaccine production at Pasteur Institute of Iran increased to 50 million doses.<sup>17, 18</sup> In 1953, the Iranian parliament passed the Vaccination Act and the Health Department of the Ministry of Health (Edarey-e Behdasht-e Vezerat-e Behdari), which was founded in 1941, managed the public vaccination program. The Pasteur Institute also served as a significant research and educational center. As an example, for the first time in Iran, in 1956 the smallpox viruses of sheep and humans were cultured at the Virology Department of Pasteur Institute of Iran.<sup>17</sup> Finally, the smallpox campaign became widespread in Iran and eventually this dreadful illness was totally eradicated by the National Vaccination Program carried out by the Health Department of the Ministry of Health (Figures 5, 6, and 7).

In November 1978, the General Department of



**Figure 5.** A smallpox vaccination station in Rasht-Gilan Province near the Caspian Sea, 1962 (Source: Saadat E., *The Progress of Medicine in Iran in Recent Seventy Years*. Tehran, Golastan Publication; 1999)



**Figure 6.** An Iranian patients with smallpox, Tehran, Iran; 1962 (Available from: URL: <http://MedicalHealthCareInfo.com>)

Communicable Disease Control and Malaria Eradication of the Ministry of Health and Welfare reported smallpox eradication in Iran to the Smallpox Eradication Unit of World Health in Geneva.<sup>19</sup>

Four pioneer physicians involved in smallpox eradication were as follows:

**Dr. Amir Aalam** (1877 – 1961) was a French trained physician and a member of the Sanitary



**Figure 7.** A certificate of smallpox inoculation in a 7-year-old boy, in a small village in Tonkabon, Mazandarn Province, 1935 (Courtesy of Professor Moslem Bahadori, Iranian Academy of Medical Sciences)

Council (Majles Hefz-o-Sehheh) and later in 1939 the professor of anatomy at Tehran Medical School who made efforts for the approval of the Act of Mandatory Vaccination at the parliament (Majles).<sup>20</sup>

**Dr. Mehdi Azar** (1903 – 1993) went to France in 1928 where he became an internist and returned to Iran in 1934. He was appointed as the Director of Razi Teaching Hospital, affiliated with Tehran Medical School, and in 1940 became a full professor of clinical medicine. Patients diagnosed with smallpox were admitted to the Infectious Diseases Department of Razi Hospital. For instance, during two successive months in 1943, 25 patients with smallpox were admitted of which 16 cases recovered and 9 patients died.<sup>20</sup>

**Dr. Naser Ansari** was born in 1913 in Isfahan and graduated from the Dar al-Fonun School. He went to Paris in 1930 and studied parasitology. On his return, he was appointed as an associate professor of parasitology at Tehran Medical School. He became a full professor in 1943. He was also the Director of the Health Research Institute of Tehran School of Medicine and cooperated with the Health Department of the Ministry of Health for the smallpox eradication program.<sup>20</sup>

**Dr. Shams ad-Din Mofidi**, the Vice-Chancellor of the Health Research Institute was also an effective figure in the promotion of the smallpox eradication program.<sup>20</sup>

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