

# ORIGINAL ARTICLE

## The Eradication of Smallpox in Bahrain

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### Abstract

In the 20th century, an unprecedented level of international cooperation led to the eradication of smallpox, infamously referred to as the most terrible ministers of death. Under the guardianship of the World Health Organisation, mass vaccination campaigns and an efficient surveillance-detection system contributed to the eradication of smallpox from Bahrain, where it was once considered endemic. The last reported outbreak of smallpox in the country occurred in the villages of Demistan and Muqsha in 1956. Smallpox in Bahrain was officially declared to have been eradicated in 1978 in a report to the Global Commission For Certification of Smallpox Eradication. Recalling the epidemiology and strategies used during this pivotal moment in medical history provides a hopeful background in tackling future diseases.

**Key words:** Smallpox, vaccination, Bahrain

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### Introduction

Smallpox was an acute contagious disease caused by the variola virus, with a characteristic set of symptoms. These symptoms included a characteristic rash, accompanied by fluid-filled blisters, nausea, high fever and malaise. Blindness was a common complication of smallpox.<sup>1</sup> Transmitted through person to person via direct contact and air droplets, it was widely considered to be one of the most devastating diseases in human history; in 18th century Europe, an estimated 400,000 people died annually to smallpox, a third of all survivors went blind.<sup>2</sup> By 1967, when the disease was still endemic in more than 30 countries, an average of 10-15 million people developed smallpox annually and more than 2 million died each year.<sup>3</sup>

The exact origin of smallpox is unknown but it is widely believed to have first appeared around 10,000 BC in north-eastern Africa. The earliest credible evidence of smallpox was found in Egyptian mummies dating back 3,000 years ago.<sup>4</sup> The influence of smallpox in human history is almost unrivalled; the Antonine plague in the 1st century, widely suspected to be smallpox, claimed the lives of almost 7 million people and contributed to the decline of the Roman Empire.<sup>2</sup> Carried on by Arab expansion, the Crusades and the discovery of the New World, the disease spread throughout much of the world. It decimated native American populations in the New World and was instrumental in the collapse of the Aztec and Incan empires. For comparison, when the conquistadors arrived in Mexico in 1518, the native population numbered an estimate 25 million. By 1620, the population had collapsed to 1.6 million.<sup>3</sup>

### Evolution of Vaccination

It was noted as early as the 4th century BC that survivors of smallpox developed an immunity to the disease and as such they were often called upon to treat the infected. Prior to the introduction of vaccinations, a technique called Variolation (or Inoculation), believed to have originated in China and the Orient before becoming widespread in Europe in the 1700s, was in use.<sup>2</sup> It was an attempt to immunise individuals against smallpox by exposing patients to powdered smallpox scabs subcutaneously, in the hope that the patient would contract a mild form of smallpox. Though it was successful, it had a greater risk than conventional vaccines.<sup>3</sup>

The acceptance of variolation amongst conservative Euro-

1- Riedel, 2005:13-20.

2- Ibid: 21-5.

3- Barquet, 1997:635-42.

4- Fenner, 1988. 209-44.



pean physicians was slow. Variolation was only accepted in England after the aggressive advocacy of Lady Mary Wortley Montague in the early 18th century.<sup>5</sup> Lady Montague's husband was the British ambassador to the Ottoman Empire in Istanbul, where she saw the effectiveness of variolation on the Turks. Having been scarred by smallpox herself, she resolved to successfully have her own children inoculated and upon her return to England, advocated for its implementation in the royal court. During the smallpox epidemic of 1721, the daughters of the Prince of Wales (the future monarch George II) were inoculated, thus solidifying the acceptance of the procedure.<sup>2</sup>

While variolation mitigated the impact of smallpox in the 18th century, it was the introduction of vaccinations by Edward Jenner that led to a substantial decrease of smallpox cases in much of Europe and North America.<sup>4</sup> Inspired by local folklore about dairymaids not contracting smallpox but contracting a milder version called cowpox, Jenner successfully managed to inoculate an eight year old boy with cowpox derived from fresh lesions on a young dairymaid. The boy suffered from a mild fever and recovered; when inoculated with smallpox, the disease did not develop. Jenner concluded that the boy was protected.<sup>2,3</sup>

In 1797, Jenner submitted a paper to the Royal Society reporting his experiment and observations. The paper was rejected. In 1798, he published a booklet titled 'An Inquiry into the Causes and Effects of the Variolae Vaccinae, a disease discovered in some of the western counties of England, particularly Gloucestershire and Known by the Name of Cow Pox', proposing his hypothesis that being infected with cowpox offers protection from smallpox. The booklet was met with mixed reactions of celebration and intense opposition from the English medical community.<sup>2</sup> Critics described his work as an unnatural and dangerous deviation from established medical practice.<sup>5</sup> His research was also under scrutiny due to the vague methodology used such as not mentioning the total number of volunteers vaccinated.<sup>6</sup>

The twentieth century was marked by a concerted effort by the World Health Organisation to eliminate smallpox through a series of co-ordinated mass vaccinations and surveillance detection systems worldwide, led by the American epidemiologist Donald Henderson.<sup>7</sup> In 1966, the 19th World Health Assembly voted overwhelmingly in favour of a worldwide eradication campaign against smallpox.

5- Koplow, 2003: 17-19.

6- Baxby, 1999: 108-10.

7- Smith, 2013: 895-9.



The smallpox vaccine was administered intradermally into the deltoid muscle of the arm or on the triceps muscle posteriorly, instead of conventional subcutaneous injections. The formation of a characteristic hard vesicle at the injection site indicated successful vaccination. Adverse effects of the vaccine ranged from fever and fatigue to serious complications such as vaccinia encephalitis, eczema vaccinatum and death. As a result, the vaccine was contraindicated in pregnant women, patients with eczema, immune deficiency disorders, leukaemia and HIV.<sup>1</sup>

On 8 May 1980, the Global Commission for Certification of Smallpox Eradication declared that smallpox had been eradicated.<sup>3</sup> Resolution WHA 33.3 of the World Health Organisation was passed and its first two sentences were:

“Having considered the development and results of the global program on smallpox eradication initiated by WHO in 1958 and intensified since 1967 ...

Declares solemnly that the world and its peoples have won freedom from smallpox, which was a most devastating disease sweeping in epidemic form through many countries since earliest time, leaving death, blindness and disfigurement in its wake and which only a decade ago was rampant in Africa, Asia and South America”<sup>8</sup>

### **Smallpox Epidemiology in Bahrain**

Bahrain is an island nation situated in the Persian Gulf. Bahrain became independent as a country in 1971. According to the Ministry of Health’s archives from the period 1925-1940, smallpox was endemic in Bahrain Island. The earliest record of an outbreak of smallpox was in 1928-1929. Students suffering from scarring as a result of smallpox were reported in 27% of urban town schools and in 50% of village schools. In the 1938/1939 annual report, smallpox was cited as “causing a high proportion of blindness in Bahrain”. Vaccinations against smallpox were available in the 1930s; however, they were requested only by “the more intelligent” portion of the population, or by people requiring it for travel. It had been agreed that a compulsory vaccination campaign would result in the eradication of smallpox; however such a campaign would draw initial opposition around the island.<sup>9</sup>

In the 1939/1940 annual report, it was reported that no new cases of smallpox were reported, presumably following the widespread implementation of a vaccination campaign primarily targeting schoolchildren and adults. Unvaccinated

8- Pennington, 2003: 762-7.

9- WHO, 1978.



children at school were promptly vaccinated, with the consent of their parents.<sup>9</sup>

Reported cases of smallpox declined in the first half of the 1940s, from 193 cases in 1941 to 14 cases in 1945. A minor outbreak occurred in 1946, causing the number of cases to spike to 21. Only 1 case of smallpox was reported between 1946-1948. In 1949, an outbreak of smallpox was reported in the district of Hoorā in the capital Manama; it saw the estimated vaccination of 22,000 residents and the quarantine of 81 reported cases of smallpox, 5 of whom died.<sup>9</sup>

Reported cases continued to decline until another outbreak struck the villages of Demistan and Muqsha in 1956. A total of 68 cases were reported, with 12 deaths reported, a majority of them being children between the ages of 8 to 12 who had not been vaccinated. It was estimated that 85% of the island's residents had been vaccinated by the time of the outbreak, thus limiting the overall outbreak of smallpox. This was the last reported outbreak of smallpox in Bahrain.<sup>9</sup> Due to a rigorous surveillance system, regional outbreaks of smallpox such as the 1967 outbreaks in Kuwait and Dubai, did not affect Bahrain island.<sup>10</sup>

### **Smallpox Vaccination**

The earliest recorded inoculation in Bahrain was in 1925, where records stated that an unidentified Arab Hakim inoculated himself directly from a cow, using methods similar to Edward Jenner.<sup>9</sup> Amidst the developing healthcare system in Bahrain in the early 20th century, a quarantine station was established in the Halat Abu-Maher island,<sup>11</sup> which was used to hold people arriving into the country until they were medically cleared to do so.<sup>10</sup>

Children under the age of 5 years were the primary targets of mass vaccination campaigns since 1950, with intensive campaigns being restarted during outbreaks of smallpox both within and around Bahrain. Freeze-dried vaccine and bifurcated needles were used for vaccinations since 1966. By 1978, it was estimated that up to 95% of the population had been vaccinated.<sup>9</sup>

Most vaccinations were predominately performed in the mild winter months between October to April, where vaccinators venture to towns and villages to in search of non-vaccinated children. Though vaccination was technically not compulsory in Bahrain, a smallpox vaccination was a requirement for visitors in most countries abroad and as a

10- Hamza, 2009: 49-55.

11- Carter, 2011: 55.



result, there were frequent revaccinations at three year intervals. The total number of vaccinations performed between 1967-1977 fluctuated but averaged at around 100,000 (see Table 1).<sup>9</sup>

**Table 1:** Smallpox vaccinations performed between 1967 to 1977<sup>9</sup>

Year	Primary	Revaccination	Total
1967	6,194	129,076	135,270
1968	1,337	64,363	65,700
1969	4,766	78,507	83,273
1970	5,742	71,725	77,467
1971	4,766	85,828	90,594
1972	6,954	100,722	107,676
1973	6,510	83,956	90,466
1974	6,072	83,927	89,999
1975	8,595	95,970	104,565
1976	6,604	80,868	87,472
1977	7,708	94,574	102,282

Perceptions of the smallpox vaccine varied over time. The local population initially appeared to have a prejudiced view towards the vaccine. As a result, in the 1928-29 outbreak, the local population was worse afflicted compared to foreigners who had been vaccinated.<sup>10</sup> Over time, positive perceptions towards the vaccine developed.

In this paper, 4 elderly Bahraini citizens who had been vaccinated were interviewed and asked to recall their experiences. The general consensus was that the vaccination campaigns were a low-key event, seen as another routine healthcare procedure. A large portion of those interviewed reported being vaccinated multiple times during their school years.

One interviewee recollected that he was vaccinated when healthcare workers had visited his area in the inner neighbourhoods of Manama in the 1960s. Another respondent elaborated on how healthcare workers from the Naim health centre and the American Mission Hospital actively went searching for infected individuals in suspected residencies and subsequent quarantining.

According to another interviewee who was vaccinated in the 1950s, she stated that people affected with smallpox were placed under quarantine. Perhaps out of fear, this caused some people to hide their infected children in mats to prevent



healthcare workers from taking them away. The final interviewee, who was vaccinated in her school, stated that it was such a low-key event that she could not recall the method of administration of the vaccine.

### Conclusion

In conclusion, the eradication of smallpox worldwide is a hallmark of what international cooperation can achieve, particularly in the field of healthcare. In the case of Bahrain, the analysis of documents from the World Health Organisation and first-hand accounts of the vaccination campaign provide a unique insight into the eradication of a disease once dubbed “the most terrible ministers of death”.<sup>6</sup> With the eradication of rinderpest in 2011 and the final phase of polio eradication in progress, studying the tactics and identifying mistakes of the past can assist in tackling future epidemics such as the recent Ebola outbreak.<sup>12, 13</sup>

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12- Morens, 2011: 502-5.

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