

A Brief History of Vaccines in India

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Abstract

The story of modern vaccines is itself a fascinating one, often tracing its genesis to Edward Jenner's discovery of the smallpox vaccine in 1796. From variolation of live viruses into healthy people, modern vaccines have come a long way. In the early years of seminal research and dicey trials, India was at the forefront of the vaccine movement. While typhoid and cholera vaccine trials took place in India, the plague vaccine was developed in Bombay by Dr. Haffkine. A checkered history of the vaccine movement has provided success stories including the eradication of polio and smallpox, but challenges remain as is evident in the current pandemic.

This research paper will briefly trace the vaccine movement in India, focusing on the initial stages of the late 19th and early 20th century and some of the measures that have shaped the vaccination programmes in India, its strengths and weaknesses and what that could mean for the future.

Keywords: *Plague Vaccine, Haffkine, Expanded Programme of Immunization India, Universal Immunization Programme India.*

Introduction

What connection could a Ukrainian born Ashkenazi Jew, Paris, Agra and the Third Aga Khan possibly have with vaccines in India?

The answer is simply the first vaccine to be indigenously developed in India.

Waldemar Haffkine was an Ashkenazi Jew born in Ukraine during the 19th century when anti-Semitism was running high in the Russian Empire. His defence of fellow Jews during one such event saw his arrest, though he was already a promising young scientist. Thus, his tutor arranged for Haffkine to join the Pasteur Institute in Paris. Albeit as a Librarian, as Jews

could not become Professors. Undeterred, Haffkine continued working on a cholera vaccine and in 1893, he came to India to test his vaccine in Agra. As news of his success was spreading, the Bubonic Plague struck Bombay. Thus, the Bombay Presidency invited Haffkine to Bombay, granting him two rooms at Grant Medical College for his laboratory. In 1898, Haffkine produced India's first home grown vaccine for plague. The Third Aga Khan immediately refurbished his home in Bombay for the young scientist and also arranged for him and several thousand people to be vaccinated, boosting confidence in the

vaccine. A year later, Dr.Haffkine's team would move into the former Government House which was subsequently renamed as the Haffkine Institute.

This fabulous story demonstrates both international co-operation and inter-communal harmony. Thanks to the religious intolerance, the loss of the Russian Empire was Bombay's gain.

From Variolation to Vaccination

The story of modern vaccination is largely credited to Edward Jenner's discovery of the smallpox vaccine at the end of the 18th century. Smallpox was a deadly and disfiguring disease that routinely ravaged parts of Asia, northern Africa and Europe. Several centuries before Jenner, the knowledge, that a tiny bit of the disease introduced into a healthy person provoked an immune response, was already understood. Between the 11th century CE and the 19th century CE, *variolation* was practiced in China, India and Turkey. Lady Montague, wife of Britain's ambassador to Turkey, provided a description of the practice in Turkey, while J.Z.Holwell outlined details of the practice in Bengal to the Royal College of Physicians in 1767. Variolation included rubbing the pus from an infected person's blisters, into the nostrils of healthy person.

The problem with variolation was that people caught varying degrees of the

disease, many died and worse still, it spread rapidly, creating smallpox outbreaks. Jenner's smallpox vaccine, made from the less virulent cowpox, offered protection without these complications. As early as 1802, the vaccine came to India and 3-year-old Anna Dusthall, became the first recipient in Bombay. But the introduction of the vaccine was by no means smooth. There were traditional *Tilakdaars* who opposed it and frightened the local population, others opposed the vaccine's genesis from the cow and people were opposed to paying for a vaccine. Traces of such opposition and naysayers abound even today as the Covid-19 pandemic vaccinations rollout.

The government responded in the 19th century by hiring 'paid vaccinators' and the vaccine was administered through public dispensaries and touring vaccinators. This was perhaps the first public vaccination programme in India. Simultaneously, variolation was banned by law.

Dr.Haffkine comes to India

The 19th century also saw outbreaks of cholera in Asia, which also infected travellers, particularly ship crews from Europe. Working at the Pasteur Institute in Paris, Waldemar Haffkine discovered what he believed was a vaccine for the disease, but he needed to conduct field tests. Meanwhile, the Government of India on the advice of

Lord and Lady Dufferin, invited Dr.Haffkine to India. Between 1893 and 1896, he conducted successful trials in Agra, thus cementing India's place in vaccine history. This success was quickly followed by Haffkine's success with the plague vaccine in India. From two rooms in Grant Medical College, Haffkine quickly produced a vaccine which was first tested on himself and then inmates of Byculla jail. His laboratory soon moved into the Aga Khan's house which was fitted with an extended laboratory and finally, into Government House, subsequently renamed Haffkine Institute in his honour. While at the Aga Khan's home, the Khoja spiritual leader arranged for about 10,000 community members to be vaccinated. This philanthropic act went a long way in encouraging people to trust the vaccine and take it. This success in the late 19th century was bolstered by the government vaccine facility in Guindy, Madras, which began producing the smallpox vaccine by 1880.

The first Roadblocks

The dawn of the 20th century brought the first hurdles in India's vaccine story. The 1892 Compulsory Vaccination Act was proving to be a paper tiger, effective only in army centres and cities and activated only during disease outbreaks. By 1907, it was also becoming clear that two

vaccine doses were required to protect against smallpox, a tall order in a populous nation like India. A few years into World War I and the Spanish flu epidemic brought further devastation and made the war on disease seem hopeless. The only spark of hope during this period was the successful trial of the typhoid vaccine in the British Indian Army.

The vaccine movement in India was more significantly affected at this time by the deaths of 19 people in 1902, who had received the plague vaccine. Dr.Haffkine was blamed for these deaths in Mulkowal, Punjab and dismissed from the laboratory he founded. This was perhaps the first AEFI or Adverse Effect Following Immunization recorded in India. However, the Lister Institute England headed a detailed investigation that cleared Dr.Haffkine. The investigation revealed that all the deceased had received their vaccines from the same vial which the administering agent had capped with an unsterilized cap. The Lister Institute's investigation was corroborated by Ronald Ross, the world's foremost malaria researcher at the time, the Royal Institute of Public Health, Birmingham University and the Rockefeller Institute. The result of this transparent study by multiple dedicated researchers restored both Dr.Haffkine's reputation and faith in the vaccine.

It is interesting to ask why the authenticities of such studies today are not so readily accepted by the public. Could it perhaps be because many vaccines are developed and produced by private/profit based pharmaceutical companies? Perhaps the public perception is that their studies will never undermine their profits. The hugely technical jargon thrown at the public is also sometimes confusing and thus unsettling. A good example would be the current confusion over certain Covid-19 vaccines causing blood clots. Though research seems to indicate that the chances are low, we are yet to hear of any specific studies on this in India.

Another roadblock, according to some opinions, was the 1919 Montague Chelmsford Reform Act which firmly placed healthcare in the hands of the provincial governments, where it remains today, rather than the Centre. Decentralization was meant to allow a more region-specific, grass root approach to healthcare but it ignored two fundamental realities; firstly that the Central government had/had greater resources than the states or local governments and secondly, co-ordination of raw material, medicines, vaccines etc, can be better managed by the central government. Once again, the current disagreement between the states and centre over vaccine/medical supply, manufacture and allocation

and inconsistent testing, lockdowns, disorganized migration of people, etc. have exposed the weakness of this policy.

A Shot in the Arm for Vaccines after World War II

The years between the World Wars and the onset of World War II, saw a certain relaxing of effort in the vaccine movement in India. In fact, the World War II saw an upsurge in smallpox and tuberculosis became a widespread disease of concern. Thus as Smallpox vaccination increased again, a BCG Laboratory was inaugurated in Madras and in 1951, the BCG vaccine was rolled out in India.

The era from 1960s and 1970s was dominated by the World Health Organization's intensified campaigns to eradicate smallpox. This provided a massive boost to vaccine infrastructure in India. With funding and expert support from the WHO, India was able to manufacture the vaccine, a nationwide cold chain network was established along with training for vaccinators, dispensaries and reporting mechanisms. By 1977, (the last smallpox case in India was reported in 1975), India was declared smallpox free and the WHO seized the chance to adopt the EPI or Expanded Programme of Immunization. The EPI encouraged countries like India to use the successful smallpox vaccine infrastructure to vaccinate against other diseases.

Thus in 1978, the EPI in India was launched with the DPT, BCG, OPV and Para-typhoid vaccines. These were specifically chosen by the India government to address those diseases most detrimental to childhood and public health. In 1981, Para-Typhoid was dropped from this list and replaced by the Anti-Tetanus vaccine for expectant mothers.

Universal Immunization Programme and the close of the 20th century

The first Indian Government initiative to revamp the vaccine programme was taken in the 1980s. This is called as the Universal Immunization Programme. As a part of this Programme, vaccination was added to the government's Technology Mission Plan and the programme was expanded to cover six diseases including DPT, BCG (TB), Polio and Measles. Emphasis was also on improving services, strengthening the nation-wide cold chain, creating a district-wise monitoring system and self-sufficiency in manufacture. The target set for this plan was 1990.

Indeed by 1991, all these vaccines except OPV were produced in India. This decade also saw a major upswing in vaccine manufacture by private pharmaceutical companies like Serum Institute of India which rolled out the MMR vaccine. In 1991, the Indian government took charge of the national cold chain from UNICEF and

passed on this responsibility to the state governments. The 1990s also saw a renewed international campaign to eradicate polio.

The 21st Century begins...

In 2001, the National Advisory Board was established to review the status of the vaccination programme in India. Its report in 2004 was the first comprehensive study in India and it resulted in the creation of the National Rural Health Mission to enhance immunization in rural areas. Between 2004 and 2007, it laid down guidelines for surveillance and response to AEFI's at the district level, training for staff, handbooks, guidelines for private medical practitioners, cold chains and surveys and assessment on vaccine wastage. But a study in 2008 by Megiddo et al about three decades of India's UIP but found vast differences in vaccine numbers in different states. It also stated that overall coverage was about 61 percent for compulsory childhood vaccines in India. In spite of this, India became polio-free by 2013 and 2012-13 was declared a Year of Intensification of Routine Immunization in 239 low-performing districts nation-wide.

Challenges to India's Universal Immunization Programme

As the Covid-19 pandemic wreaks havoc and the slow pace of vaccinations in India cause concern,

certain aspects of India's vaccination programme have come under scrutiny.

- In March 2020, the Director General of Health Services, Government of India, listed 26 vaccine manufacturers in India, mostly private companies. However, the emphasis is clearly on manufacture and not on research and development. Lack of funding for research, strict international guidelines for research, potential lawsuits, poor infrastructure and low salaries discourage R&D. However, it is understood that Indian laboratories are no longer at the helm of vaccine research as they were a hundred years ago.
- There is substantial disparity in vaccine levels between states. While states like Maharashtra, Kerala, Karnataka, Tamil Nadu, Punjab, Haryana and Himachal Pradesh can boast of over 70percent coverage of children, Madhya Pradesh, UP and Bihar lie between 40-50percent and several North Eastern States record less than 40percent coverage.
- In the first decade of the 21st century, the WHO complained that three out of four government vaccine manufacturing facilities in India were manufacturing below standard vaccines. Already, many non-compulsory vaccines

such as influenza, MMR, Hepatitis and some compulsory ones like Anti-Tetanus were being manufactured in state-of-the-art private facilities. Thus, as the three government facilities shut to renovate, the private sector gradually took over.

So where do we go from here?

- In 2008, the Integrated Vaccine Complex was established over 100 acres of land near Chennai at the cost of about Rs. 900 crores. Completed by 2017, capable of producing 1 billion vaccine doses per year, this facility lies idle. Why did the Indian government loan crores of rupees to private companies to manufacture the Covid-19 vaccine when it could have invested this sum in its own facility? The Haffkine Institute, not flagged by the WHO, was roped in to manufacture the Covid vaccines only recently and production is yet to begin. Why were all available Government Laboratories not pressed into service, given India's huge population? The monopoly of private vaccine companies, especially for compulsory vaccines, must be challenged if the vaccination programme is to be made universal and affordable.
- If over a hundred years ago, the Plague and Typhoid vaccines

could be developed in India, then why not now? The government must encourage research and researchers. Our medical personnel and scientists are second to none worldwide, but mechanisms and remuneration must be enhanced to retain and nurture this talent.

- Even if healthcare is to remain a state responsibility, state and district authorities must be held accountable for compulsory vaccine coverage in their areas. The disparity in numbers in 21st century India is unacceptable as mass migration for work is now a permanent feature of our landscape.
- The Central Government must exercise greater transparency and leadership when faced with a crisis. Allocation of vaccines, loans, manufacturing contracts must stand up to public scrutiny. Moreover, the government must accept that universal basic healthcare is due to every citizen. There is no such thing as

“free health-care” or “free vaccines”, as taxpayers we pay for these facilities and are thus owed decent service and accountability.

- When the smallpox and polio-eradication programmes were introduced in India, the government rolled outdoor-to-door campaigns, advertisements and other creative ways to encourage vaccination. In some parts of India, Amitabh Bachchan's polio adverts inspired people to vaccinate their children. The same commitment, urgency and creativity are required at a sustained level.

Now, as India strives to vaccinate a billion plus people, it is possible to use this opportunity to plug gaps, enhance public health infrastructure and spend money on prevention and eradication of disease. It's time for India to once again be at the vanguard of the vaccination movement.

References

- Bennet M. (2020, October25). How the World's First Vaccine Came to India, Indian Express. Retrieved from: <https://indianexpress.com/article/opinion/columns/how-the-worlds-first-vaccine-came-to-india-6873562/>
- Chaitanya S.V. Krishna. (2021, May 19). What is Plaguening Integrated Vaccine Complex At Chengalpattu, The New Indian Express. Retrieved from: <https://www.newindianexpress.com/cities/chennai/2021/may/19/what-is-plaguening-integrated-vaccine-complexat-chengalpattu-2304396.html>
- Director General of Health Services, Ministry of Health & Family Welfare, Government of India. (updated 2020, April 1). Vaccine and Vaccine Manufacturing Institutes In India. Director General Of Health Services [dghs]. Retrieved from: https://dghs.gov.in/content/6_1_Institutes.aspx
- Evans K. From Variolation to Vaccination, Retrieved from: <https://www.labroots.com/trending/microbiology/4928/variolation-vaccination/amp>
- Haffkine Institute, Haffkine Institute History, Retrieved from: <http://www.haffkineinstitute.org/institute.htm>
- Hawgood Barbara J. (2007, February)Walderman Mordecai, Haffkine Institute History Haffkine CIE (1860-1930) Prophylactic Vaccination against Cholera & Bubonic Plague in British India, Journal of Medical Biography Vol. 15, Retrieved from: <https://www.jameslindlibrary.org/wp-data/uploads/2014/05/Haffkine-1896-Publication.pdf>
- Krishnan R. & Ghosh A. (2021, April 1). India Needs Vaccines Now, The Print, Retrieved from: <https://theprint.in/india/india-needs-vaccines-now-but-this-govt-plant-in-tamil-nadu-has-been-idle-for-9-years/631770/>
- Lahariya C. (2014 April)A Brief History of Vaccines and Vaccination in India, Indian Journal of Medical Research (IJMR), 139:491-511. Retrieved from: [https://www.ijmr.org.in/text.asp?2014/139/4/491/134094,PMC4078488,](https://www.ijmr.org.in/text.asp?2014/139/4/491/134094,PMC4078488)
- Meggio I., Abigail C., Nandi A., Chatterjee S., Shankar P., Khera A. &Laxminarayan R. (2014). Analysis of the UIP & Introduction of a Rotavirus Vaccine in India with IndiaSim, pub. Elsevier Ltd. & Vaccine. Retrieved From: http://dcp-3.org/sites/default/files/resources/IndiaSim_Vaccine.pdf
- Ramadoss A. (2021, May 20).I didn't destroy India's Self-sufficiency in Vaccine Production, Business Standard. Retrieved from: https://www.business-standard.com/article/current-affairs/i-didn-t-destroy-india-s-self-sufficiency-in-vaccine-production-ramadoss-121052000854_1.html