

The fight against smallpox during the Savoy kingdom in Genoa between 1815 and 1859

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Key words

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Summary

Introduction. The article aims to outline the features of the efforts for smallpox eradication within the pre-unitary context of the Kingdom of Sardinia, characterized by a long tradition in medical-health prevention. This tradition is partly inherited from the health magistracies of the Italian states during the ancient regime and partly adopted from policies initially outlined by Napoleon and later by other European states. In addition to prevention activities, authorities also engage in a vigorous information and awareness campaign aimed at eliminating common prejudices and doubts about vaccination among the population.

Methods. In analyzing the authorities' achievements in combating smallpox, this study examines the two epidemic waves (1829-30 and 1852-54), along with the legislative developments before, during, and after these periods. It also compares these regulatory changes with those in other European contexts.

Discussion. The epidemiological situation turned out to be more complex to manage than the authorities had anticipated, as evi-

denced by the increasing controls imposed. Scientific and political communities, both in the Kingdom of Sardinia and in other European nations, found themselves divided on the legitimacy of proposing restrictive measures by the state. Some advocated for restricted access to public places and imposed mandatory vaccination for vulnerable individuals.

Conclusions. The comparison with smallpox resulted in a gradual improvement in of health security levels, although vaccination coverage did not reach the desired targets. Several factors contributed to this failure, including the limited expertise and reluctance of medical personnel, who were burdened with much of the operation's costs. Additionally, particularly in rural areas, there was widespread mistrust among the population towards doctors. Despite these challenges, the fight against smallpox enabled authorities to develop population control tools in the name of public health protection. However, it was not until 1888 that mandatory vaccination was introduced.

Introduction

In the late early modern period and the onset of the modern age, smallpox significantly impacted Europe. Though Europeans were familiar with the disease from ancient records, it reemerged around 1500, becoming endemic by the second half of the 18th century and persisting until the 20th century. During this time, smallpox alternated with the plague, which gradually disappeared [1].

In Europe, the most crucial contribution to variolation/inoculation was made by a woman called Mary Wortely Montagu (1689-1762) (Fig. 1) whose husband Edward Wortley Montagu, was the British ambassador to the Ottoman Empire in Constantinople between 1716 and 1718 [2].

Lady Montagu was a spirited and independent woman who explored the city and learned about local customs. To preserve her anonymity, she wore a veil and, during this time, she learned about the practice of inoculation [3]. In a letter dated April 1, 1717, she provided a fascinating description of inoculation was performed, as she had seen it [4].

The inoculation procedure consisted of an immunological

Fig. 1. Mary Wortely Montagu in Turkish dress (Public Domain. Wikipedia commons).



practice recorded by the medical community in the early 1720s, was rooted in Eastern traditions. Upon recognizing its origins, the medical community sought to establish a scientific basis for it to address the doubts it raised [5].

Credit for raising awareness of this method goes to Lady Mary Wortley Montagu. Her efforts were challenging due to the prejudices surrounding the practice's Eastern and Islamic origins, which were considered pagan at the time. Initially, the Church opposed the practice but eventually changed its stance [6].

Variolization consisted of inoculating a healthy patient with infected material or scabs taken from patients who had presented a mild form of smallpox. Inoculation was carried out using various methods; in Europe the practice adopted involved making an incision in the epidermis followed by grafting.

The problems related to this practice, which strongly hindered its widespread diffusion (unlike the Jennerian vaccine)², were due to multiple factors, with the primary one being the inherent risk of the practice. Patients who underwent this form of inoculation could contract a very severe and occasionally lethal form of smallpox [7].

The Cremonese doctor Valeriano Brera stated that «... smallpox inoculation produced one death for every sixty inoculated individuals ...» [8] another concern associated with this practice was the risk that the inoculated patients themselves could become sources of contagion for others, causing outbreaks. In some instances, the outcomes of the inoculation were uncertain due to the absence of the typical scar at the inoculation site.

Other types of immunization practices were present since ancient times among various populations, including the Chinese, Persians, or Indians. These practices involved methods such as «placing healthy and infected individuals in contact, or transmitting pus-stained clothing from sick individuals to non-immune individuals» [9] or «among the Chinese, according to the testimony of the Jesuit François Xavier d'Entrecolles (1726), crushed smallpox scabs were inhaled by individuals to be immunized, placed on cotton or on the cocoon of a silkworm» [9]. Nevertheless, variolation was the most commonly used method

Despite efforts to raise awareness of prevention methods, such practices remained rare due to the aforementioned reasons. Ultimately, the Church played a significant role, by invoking theological arguments against them, claiming that injecting “corrupted material” into individuals was contrary to the will of God. This narrative quickly resonated across different social layers in Italy and Europe reinforcing prejudices associated with the Eastern origin of variolation, associating racial stereotypes with the practice [9].

Things started to change towards the end of the 18th century, thanks to the discovery made by Edward Jenner (Fig 2).

The revolutionary significance of this discovery was understood from the very beginning, leading to the first powerful vaccination campaign between 1798 and

Fig. 2. Edward Jenner (1749-1823) (Public Domain. Wikipedia commons).



1814 [5]. By the early months of 1801, vaccination was being implemented on a large scale in the English army and in Napoleon's France. Napoleon himself promoted the practice, expanding it to the entire empire, which also included parts of Italy [10].

VACCINATION CAMPAIGNS IN THE KINGDOM OF SARDINIA

Under the French rule, the territories of the Kingdom of Sardinia were subjected to French healthcare policies. In the effort to promote vaccination in Piedmont, Michele Francesco Buniva (1761-1834), an Italian naturalist and physician, played a central role. He became a professor of medical institutions in 1789 and later took up the chair of pathology at the University of Turin in 1799. Despite Buniva was dismissed from the university in 1814 due to his liberal ideas, he was credited with introducing smallpox vaccination in Piedmont [11]. He was a leading advocate for a comprehensive healthcare reform that led to the creation of a superior health council aimed at overcoming the outdated forms of health governance implemented during the ancient regime [5]. While Italian cities such as Milan, Turin, Genoa, Venice, and Florence had been pioneers in healthcare prevention in the previous centuries, the leadership in healthcare innovation shifted to various northern European nations, between the 1700s and 1800s [13].

Buniva's vision was to set aside and beyond the outdated policing approach implemented in the past [14]. Despite their previous effectiveness, these methods were becoming increasingly inadequate for managing the complexities of 19th-century urban environments. The superior health council was intended to act as an intermediary between the scientific community of physicians and academics and that of civil society. Its role was to implement a policy of intense surveillance and control over food, workplaces, and the pathogenic forms related to these areas in order to protect public health [5].

With the end of the Napoleonic era, the territories of

the Republic of Genoa were annexed to the Kingdom of Sardinia. Following the restoration of the monarchy in 1815, vaccination efforts were abruptly halted. The group of physicians who worked in the superior health council, an institution established during the Napoleonic administration, including Buniva himself, were dismissed, as part of a political purge intended to eliminate those considered disloyal to the House of Savoy due to their collaboration with the French administration.

However, Vittorio Emanuele I of Savoy's decision proved to be short-sighted, in fact already starting from 1819, a Superior Vaccine Board was created in Turin, to which the provincial boards of Nice, Genoa, and Chambery [5] were to report. This sudden change was driven by new challenges emerging in the field of healthcare. It was, in fact, a recovery of the administrative structures created during the French rule.

As director-general of the Superior Vaccine Board, Giuseppe Audiberti was chosen and appointed for his expertise in the field, acquired through study trips abroad, particularly in Paris and London. His loyalty during the political turmoil of his exile earned him the admiration of King Vittorio Emanuele, who subsequently elevated him to the rank of count following Napoleon's downfall [15]. He was chosen because due to his role as the vice-president of the Academy of Sciences and for his close relationship with the king during exile. To support him on the board, two other important physicians were appointed: Tommaso Domenico Griva, a student of Michele Buniva who became Audiberti's secretary in 1819 [5] and Lorenzo Martini [16] (1785-1844), a physician, physiologist, pedagogue, and future rector of the University of Turin, who served as vice-conservator in the Superior Board.

The board operated throughout the Kingdom from 1819 until 1859. Despite implementing smallpox containment and vaccination strategies similar to those of other European states, these efforts were insufficient to prevent repeated smallpox epidemics in the Kingdom of Sardinia, especially in the province of Genoa, during 1829-30 and 1852-54 [17]. The second epidemic lasted longer due to the simultaneous outbreak of cholera [18], which diverted many resources previously allocated to fight smallpox due to its greater perceived threat. Following the directives of the central Savoyard administration, the provincial board of Genoa moved following two different levels: a) preventive and b) extraordinary.

- a. Among the preventive measures, numerous reports and inquiries were conducted with vaccinating physicians concerning vaccine administration and population's health status. Constant censuses were taken of vaccinating physicians and facilities dedicated to treating the sick. Vaccination, along with isolation, were recognized as the only effective methods for treating this disease. Preventive efforts particularly focused on the vaccine: its procurement, storage, population information-awareness campaigns, and administration.
- b. Among the extraordinary measures, the board

promptly issued the regulations under the royal patents concerning smallpox vaccination. Some articles extracted from the regulation of royal patents issued on July 1st, 1819 [18], include:

- Article 8: "All students who have not received a successful vaccination or have not contracted true smallpox shall not be admitted to schools" [19].
- Article 9: The mandatory nature of vaccination was extended to: "All those currently receiving or who will in the future receive free aid from charitable or benevolent congregations must provide proof within three months that all individuals in their family under the age of 20 have been vaccinated or have had smallpox" [19].

Vaccination thus became mandatory for all students to access public facilities with non-compliance resulting in exclusion. This mandate particularly targeted the youngest and the poorest segments of the population, requiring families receiving subsidies to vaccinate all members under 20 years of age, otherwise they had to face suspension of their aid.

To encourage young people who did not attend school, and thus were not subject to mandatory vaccination to still undergo the treatment, the service was made free of charge [10].

The provincial board, adhering to a utilitarian approach that differs significantly from our modern concept of public health welfare, decided to restrict assistance and free home care to only those poor families willing to have their child/children vaccinated. These families had make their children available to doctors who would use the child to vaccinate others. Mothers who accepted this agreement were provided with various forms of compensation.

In a letter to the president of the provincial health council in Genoa, D. Prasca, a regional health councilor in Genoa, highlighted the discord among the various administrators regarding the amount of rewards that would be distributed to the mothers of the children used for vaccination [19].

The practice of giving rewards was not necessarily an invention of the Savoyard administration; it already existed under the French administration. For instance, symbolic rewards such as a package of confectionery and a gratuity of three lire each were given, or in another case, a "complete outfit" including a hat and a pair of shoes [5].

-Regarding health patents, the regulation issued in 1819 established a rigorous standardization in their form and the data reported to avoid possible falsifications, which had occurred in the past [21].

During the vaccination campaign, authorities paid special attention to vulnerable individuals. Articles 6 and 7 of the instructions for vaccine propagation, dated January 1st, 1820, specified that if individuals presented themselves and officials deemed it prudent not to vaccinate them due to health reasons, their vaccination would be postponed until their health improved. In cases where deferred patients required a patent to access public facilities, a temporary certificate for three months was

issued, explaining the reason for not being vaccinated. At the end of the validity period, individuals had to return to the designated vaccination site and if they were deferred again, the procedure was repeated [19]. Patients could be deemed ineligible for vaccination due to high fever, poor health from other illnesses, or advanced age. Meanwhile, a powerful information and awareness campaign was financed, involving even Count Audiberti, the general director of vaccinations.

When compulsory vaccination for all schoolchildren was decreed, his speech was published in the official gazette, where he discussed about the recent vaccine as a new tool to combat smallpox. While such posters were not new, raising awareness among the population remained crucial due to the low number of visits to vaccinating physicians.

EUROPEAN CONTEX

The issue of mandatory vaccination [22] and the forced recruitment of doctors who were in favor of spreading the serum but opposed to its imposition sparked heated debate across European nations [23] leading to various policies on this matter:

- Indeed, some nations, such as the Kingdom of the Netherlands, implemented mandatory vaccination for children under 6 months of age as early as 1818;
- During the same period, the Kingdom of Sardinia lacked a dedicated entity for vaccination [5] campaigns. Administrators loyal to the king, even during the Napoleonic period, chose to dissolve previous health bodies at the start of the restoration process due to political rivalries, without paying attention to public health protection. In contrast, other nations, such as England, took significant measures by enacting the *Vaccination Acts* of 1840, 1841, and 1854 to enforce universal and free smallpox vaccination, though this obligation was eventually abolished in 1898;
- Much stricter measures were adopted by the Kingdom of the Two Sicilies, which ordered “deportation of families who refused vaccination to locations at least six miles away from their homes, allowing their return only after they agreed to vaccinate their children” [8].

The strategy of the Kingdom of Sardinia was decidedly softer, opting for annual vaccination campaigns and inspections by inspectors in schools. However, the efforts made did not prevent smallpox from triggering an epidemic that spread in the province between 1829 and 1830 [24].

Following this, the authorities decided to tighten the regulations. The vaccination campaigns became more widespread, occurring annually even in peripheral areas. At the same time, there was increased scrutiny of doctors’ actions, as many were found to issue false certificates in exchange for cash or other benefits, thus aiding those who did not want to be vaccinated and receiving gratification for each self-certified vaccination they performed. However, this was mainly the case for non-contracted physicians, who were hired and compensated based on

Fig. 3. Lorenzo Martini (1785-1844) (Public Domain. Wikipedia commons).



their performance during emergencies or staff shortages. These doctors were rewarded for each self-certified vaccination they performed. Despite these challenges, the healthcare system overall remained resilient, and the state of emergency was quickly brought under control. Certainly, this was likely due to well-distributed healthcare facilities across the territory [12] and to the (though not yet sufficient) vaccination coverage.

THE VACCINATION FROM 1830 AND THE ROLE OF LORENZO MARTINI

Starting from 1830, Lorenzo Martini’s [19] (Fig. 3) outreach activities became more intense. He educated both the civilian population and medical personnel through posters that conveyed his speeches.

It should be noted that these individuals often lacked adequate training on the subject, and even when they did have training, they viewed vaccination a task beneath their status [8]. Consequentially, they were not readily available to assist the authorities.

The posters aimed at both physicians and the general population addressed a range of topics related to vaccination. They covered methods for administering and controlling the inoculation process, the expected outcomes of vaccination (including how well-informed mothers and wet nurses could also conduct these controls independently, according to Martini), the proper preservation of vaccine pus, criteria for selecting patients for arm-to-arm vaccination, distinguishing chickenpox from smallpox, and other relevant subjects.

Lorenzo Martini followed a very particular course of study: his studies and research increased also towards medical-physiological and medico-legal studies, but he was not only a great physician because he extended his knowledge in the humanities field.

He devoted his time and developed his studies on thinkers’ philosophers of the Greek classical period. Furthermore, in 1840 he managed to write a text on the history of philosophy entitled “*Storia della filosofia*”

(History of Philosophy), edited in three 3 volumes [Ed. Pirotta, Milano 1840]; “*Della sapienza dei greci*” (About the wisdom of the Greeks), [Ed. Cassone e Marzorati, Torino 1836], and in 1844, before she passed away, she managed to give a written manuscript on Plato; it was a *compendium* dedicated to Plato completed in 1844 entitled “*Platone compendiato e commentato* (Plato summarized and commented), [Ed. Elvetica, Capolago 1844].

He also devoted himself to educational and pedagogical studies with interesting publications, e.g. “*Riforma della prima educazione*” (*Reform of the first education*), [Ed. Marietti, Torino 1834]; “*Emilio*” consisting of 12 volumes, [Ed. Marietti, Torino 1821-1823].

MARTINI’S INNOVATION LAYS IN THE CLEAR AND SIMPLE STYLE HE EMPLOYED IN HIS WRITINGS [19].

To persuade the stubborn and hesitant individuals about vaccination, Martini examined the most common arguments against it in the population and systematically dismantled them in a straightforward yet comprehensive manner. His goal was to foster dialogue and understanding among those fearful of the practice. This approach involved a carefully crafted communication strategy and the use of gentle, non-confrontational language to avoid harsh tones.

Between 1820 and 1840, the president of the provincial observed that smallpox had become endemic. To prevent a new epidemic emergency, he imposed severe restrictions regarding controls and extended the vaccination mandate to additional groups beyond schoolchildren [25]. Municipal administration employees and those receiving pensions from the Royal Navy they had to provide proof that they and their children had been vaccinated, or else their salaries would be suspended until vaccination was carried out.

The epidemic of 1852 and conclusions

In 1852, a new and rapid pandemic broke out in Genoa, schools and public offices were converted into patient care centers because hospitals were full and additionally, cash rewards were given to mothers who offered their children for the reproduction of the vaccine due to the shortage of fresh serum.

The arrival of cholera in the city in 1854 [26] further worsened the situation. Cholera was not new to the health authorities of the Italian states, having previously caused approximately 150,000 deaths between 1835 and 1838, including three thousand in the Genoa alone [1]. The authorities had to deal with this new emergency [27] which had significant practical repercussions, leading to the reallocation of financial resources originally intended for combating smallpox to address the cholera emergency. This resulted in a prolonged duration of the smallpox epidemic.

The epidemic finally subsided towards the end of 1854, though new, more contained waves emerged 1856-57. Several factors contributed to the resurgence:

- Insufficient financial resources discouraged doctors from practicing, as they preferred more lucrative private practice;
- Poor training of some medical personnel compromised vaccination success due to improper execution or the use of compromised serum, which was handled by medical personnel;
- Deep-seated mistrust of the medical personnel among the population, which prevented some individuals from being convinced to undergo vaccination;
- Ineffective regulations failed to adequately address negligent doctors and those who violated protocols.

In 1857, the vaccinated population in the province of Genoa amounted to approximately 56.9% of the total. This figure varied widely across the territory due to poor road conditions, which made vaccination in the suburbs challenging, and differing levels of knowledge and management among local authorities and medical personnel. By comparison, the average vaccinated population in the Kingdom of the Two Sicilies in 1851 was 70.4% [8].

The vaccination coverage results were sufficient to avoid high mortality rates but not enough to contain pandemics. This was the situation shortly before the Unification of Italy. It was not until 1888, with the enactment of the Crispi-Pagliani law, that smallpox vaccination became mandatory. Despite this, smallpox continued to affect the peninsula until the late 1900s [28].

Vaccination has been both celebrated and criticized throughout the history of medicine and public health, dating back to Edward Jenner’s time in 1798. The concept of injecting a mild form of “disease” into a healthy person faced opposition even before vaccines were discovered. The authors remember also that Bourbon king Ferdinand planned and introduced the first “free large-scale mass vaccination programme” conducted in Italy and one of the first in Europe to counteract smallpox. The vaccination campaign was marked by many difficulties and the efforts made by the Southern Kingdoms governors were huge [9, 10]. The “ante litteram communication campaign”, aimed at convincing the so-called “hesitant” people and at confuting the opinions, beliefs, views, and behaviours of vaccination opponents, was impressive [29-32].

By 1821, compulsory vaccination had significantly reduced smallpox infections and death rates. Later, several experiences followed this enterprise, even with heated debates and discussions, of course. Smallpox was finally eradicated worldwide only on the 9th December 1979.

The recent health emergency caused by COVID-19 disease and other health emergencies show many connections with well-known epidemics of the past [33, 34].

Understanding how previous outbreaks were managed can provide valuable insights and tools for addressing current and future infectious disease challenges.

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Authors' contributions

mM and AP: designed the study, MM & AP conceived the manuscript; AP, MM, LV drafted the manuscript; MM, AP and LV: revised the manuscript; DO, MM and AP performed a search of the literature; DO, LV: critically revised the manuscript; AP, MM, LV: conceptualization, and methodology; LV, AP, MM, DO investigation and data curation; AP, MM: original draft preparation; LV: editing. All authors have read and approved the latest version of the paper for publication.

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