

Epidemiological uncertainty and colonial plague governance: The case of Madras City

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Abstract

The outbreak of bubonic plague in colonial India during the late nineteenth and early twentieth centuries prompted extensive and intensive sanitary interventions and surveillance by colonial scientific and administrative agencies. Historiographical studies on plague governance have emphasised that these colonial agencies employed coercive methods such as segregation, inspection, and quarantine, particularly in severely affected regions such as Bombay. Madras, however, presented a different epidemiological pattern. Despite conditions associated with plague transmission and repeated importation, the city experienced comparatively limited incidence, which contemporary medical investigations could not satisfactorily explain through a single epidemiological framework or by applying the Bombay method. This article dwells on how this pattern, and local conditions, shaped or obligated the colonial government to develop a different approach for governing plague in Madras. Adopting a qualitative historical approach, the study drew on diverse sources such as plague commission and investigation reports, sanitary and administrative records, colonial legislation, and contemporary medical journals. The findings show that generalised scientific explanations through rat–flea transmission, climatic conditions, and environmental and biological factors did not fully explain the limited incidence of plague in Madras. In order to govern or control the plague, the colonial government invoked its legal power as the state and employed coercive methods, which faced a mixed response of cooperation and resistance from the people; it also offered an interpretation for the low incidence by attributing it to immunity when no single epidemiological framework could be established. By bringing together epidemiological interpretation and the control and governance methods adopted in Madras city, this study demonstrates the limitations of applying a predominantly Bombay-centred framework to Madras and emphasises the importance of regional variation in understanding the plague and the need for evolving region-specific governance methods.

Keywords: *regional variation, disease surveillance, coercion, medical knowledge, public health*

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1. Introduction

In the late nineteenth century, bubonic plague emerged as a major public-health crisis in colonial India. Bombay became one of the principal centres of the epidemic. Colonial authorities responded through intrusive sanitary measures, particularly the enactment of the Epidemic Diseases Act of 1897. Historical research has so far focused on two broad issues: the methods of disease control employed by the colonial state and the native response to such methods. While the state had employed coercive measures such as segregation, forced inspection, and quarantine, the response of the natives was a combination of resistance, cooperation and evasion. Resistance and evasion, rather than cooperation, were visible in India because the colonial state used medical intervention as a tool to expand its authority and maintain surveillance over its subjects (Arnold, 1993). Further, these interventions were embedded not only in medical rationality but also based on political and economic considerations (Harrison, 1994). These interpretations establish the interrelationship between colonial authority and epidemic governance, considering factors such as politics, the economy, and local institutions in determining public-health measures.

The plague control measures in Bombay provoked social resistance due to coercive intervention by colonial authorities, such as compulsory segregation, house-to-house inspections and forced removal of suspected patients to hospitals. These policies fostered widespread public mistrust of colonial authorities. Consequently, Bombay's experience became an important historiographical interpretation that emphasised colonial state power, coercive intervention and public resistance (Klein, 1988). However, the generalised prominence of this view raises the question of whether the coercion-resistance framework can adequately explain plague governance in regions where incidence and epidemiological patterns were different. Madras provides an important case for examining this question because its epidemiological experience differed considerably from that of Bombay.

Colonial Madras, a major port city described by a dense population, commercial activity, and maritime connections with Europe and Southeast Asia, nevertheless recorded a lower incidence of plague than Bombay. This divergence of limited plague incidence in Madras is difficult to explain within contemporary epidemiological interpretations. One explanation invoked “immunity” as an apparent reason for the low incidence of plague in Madras. However, contemporary discussions on the plague questioned whether such immunity could be attributed to inherent environmental or climatic conditions. A contemporary account

in *The Lancet* observed that, although plague was repeatedly imported into Madras, it did not result in widespread epidemic transmission, while the causes for this divergence remained unresolved (“Anomalies of Plague Incidence in India,” 1911). The competing interpretations suggest that contemporary medical observers struggled to offer a definite explanation for the low incidence of plague in Madras city. Epidemiological views also considered ‘immunity of the wild rat’ as a possible reason for the low incidence, but experimental investigation found rats from Madras were susceptible to plague, making biological resistance of the local rat population insufficient to explain the limited incidence in Madras. Thus, the coexistence of different explanations concerning immunity, environmental conditions, and epidemiological factors supports that contemporary investigators did not arrive at a single framework for the epidemiological pattern in Madras. Rather than treating Madras simply as naturally protected from the disease, these competing explanations make Madras city an important case for examining plague governance under regionally specific conditions.

Prominent themes in historical analyses of plague governance in colonial India have focused on severely affected regions like Bombay, where coercive intervention by state authority and public resistance have been central. The experience of Madras is not easily explained by an analytical framework derived from severely affected regions, raising the question of divergence. Therefore, the historical significance of Madras lies not in the less attention it received than Bombay, but in the different relationship it reveals between disease incidence, administrative intervention, and scientific interpretation. An epidemic outbreak cannot be understood solely through biological mechanisms but must be situated within its broader social, economic, and political conditions (Packard, 1989). From this perspective, colonial Madras requires attention to the particular epidemiological conditions, medical infrastructure and expertise, institutional facilities and interactions between officials and the local population. Examining these factors provides a basis for understanding how regional conditions shaped practical epidemic governance.

In this context, this study aims to: (1) examine the epidemiological conditions that distinguished the experience of plague in colonial Madras from Bombay; (2) analyse the limitations and competing interpretations within colonial epidemiological knowledge concerning plague in Madras; and (3) examine the relationship between legal powers, administrative capacity, selective interventions, interpretations of “immunity,” and plague governance in the city. By addressing these objectives and focusing on Madras as the principal

case, the study contributes to the historiography of colonial epidemic governance by demonstrating that regional epidemiological and administrative conditions have shaped colonial public health responses.

2. Literature Review

2.1 Colonial Medicine and Public-Health Governance

Historiography on colonial medicine and public health situates these fields within the political and cultural structures of British rule in India. Arnold (1993) argues that the expansion of Western medicine and public health centred on the political priorities and cultural conditions of colonial rule. Similarly, Harrison (1994) explains that colonial medical intervention was shaped by revenue constraints, local resistance, and competing claims on resources across different levels of government. Public health policies during the colonial period were shaped by medical knowledge, administrative capacity, financial resources, and local response.

According to Bhattacharya (2012), public health in colonial India was concentrated in colonial enclaves where political and economic interest converged, such as ports, military cantonments and European settlements. Thus, colonial public health and disease control are related more to state power and intervention than to medical rationality alone. This interpretation shows that public health policies in colonial India were not uniform, providing a basis for examining the regional differences in epidemic governance.

2.2 Historiography of Plague in Colonial India

Historiography of plague in colonial India has largely examined epidemic outbreaks through the interrelationship between state intervention, people's response or resistance, and variations in incidence. Arnold (1987) examines the early plague epidemic through the changing relationship between Indian society and the colonial state to understand epidemic not simply as a medical event but as a means of examining changing relations between Indian elites, marginalised sections of society, and the colonial administration. Furthermore, the body is an arena of contestation between the state and local politics: state intervention sought to identify and regulate individuals, while people's resistance involved bodily evasion and concealment. Similarly, Klein (1988) examines the consequences of plague intervention as a source of social tension and confrontation between the state and local society. The geographic location influences the regional variation of mortality. Thus, plague incidence needs to be

interpreted within the interaction of political, economic, social, environmental and biological conditions.

Recent scholarship examined the production of contemporary epidemiological knowledge and the understanding of disease causation. According to Chakrabarti (2012), the idea of bacteriological knowledge of Europeans was not simply transferred to colonial India; rather, it was shaped through the interaction between laboratory practices and colonial environments. More recently, Sarkar (2024), building on earlier studies by Arnold (1987) and Klein (1988), emphasises the shifting perceptions of disease within the political and scientific community over plague causation and incidence. Empirical evidence shows a historiographical shift from earlier emphasis on colonial intervention and resistance to greater attention to scientific knowledge, administrative actions and regional variation.

2.3 The Bombay-Centred Interpretation

Bombay occupied a central position in the historiography of plague in colonial India because of the severity of the plague incidence and the intensity of colonial intervention. Sarkar (2024) explicitly observes that Bombay was an important case study in the historiography of plague because it was a major colonial metropolis with commercial expansion, migration and complex urban conditions, and the severity of epidemic expansion was particularly visible. Similarly, Echenberg (2002) places Bombay within the wider history of the early years of the third plague pandemic after the Justinian Plague, 542 C.E., and the Black Death, 1347 C.E.

Kidambi (2004) notes that plague historiography has concentrated on compulsory hospitalisation, house-to-house searches, segregation, and quarantine, but colonial authorities associated the disease with poor sanitary conditions within particular localities. Anti-plague interventions in Bombay were directed towards poor and densely populated urban neighbourhoods. Sud (2020) further describes Bombay's response as involving invasive and destructive plague-control measures at an unprecedented scale, while intervention occurred amid conflicting theories of disease causation. Coercion, resistance, environmental factors, class differentiation, and urban regulation became central to interpretations of plague in Bombay. However, the strong focus on Bombay raises an important question: whether interpretations based largely on the experience of a severely affected city can adequately explain regions where plague incidence and administrative responses differ.

2.4 Madras and Regional Variation

Klein (1988) emphasise the geographical unevenness in plague incidence, noting that Madras, despite overcrowding, poor sanitation, substantial rat populations, and the repeated importation of plague infection, largely escaped severe epidemic mortality. More recently, Ramesh (2025) has developed this regional perspective by arguing that British India represented a deeply varying geography, with no singular trajectory of disease, and that focusing on severely affected cities curtails our understanding of plague's varied trajectories in the city. Particularly significant is Ramesh's identification of a dissonance between lab and field, as experimental findings suggested conditions favourable to plague while observations in Madras indicated otherwise. This demonstrates the complexity of explaining Madras's distinctive experience of plague beyond models derived from cities that were more severely affected.

Mahammadh (2020) observes that Arnold's (1987) influential study of the early plague epidemic focused on western India and did not address South India or the Madras Presidency. The variations in plague mortality across the Madras Presidency pinpoints the ineffectiveness of public health officials, often due to inadequate powers and allocated funds. There is also a persistent gap between official recommendations and actual conditions. Similarly, Jha and Shubham (2023) emphasise India's diverse socioeconomic and climatic conditions through the colonial Bihar where plague incidence varied geographically and temporally even within a single province. The plague in colonial India followed regionally differentiated epidemiological and administrative trajectories, prompting local conditions as essential to understanding both disease incidence and the nature of colonial responses.

2.5 Theoretical Framework

This study evaluates plague governance through the interrelationship between state regulation, medical knowledge, and epidemiological uncertainty. According to Foucault (2007), understanding of governmentality provides a framework for examining how epidemic governance operated through population regulation, surveillance, and administrative practices. In discussing plague regulations, individuals present themselves to inspectors and open their homes to them as part of a disciplinary system. At the same time, identification of the treatment of the uncertain, the aleatory, as a feature of security offers a useful way to consider how authorities responded to conditions they could not fully predict or control. Scott (1998)

complements this perspective by identifying legibility as a central problem in statecraft, whereby complex populations and social conditions are transformed into administrative categories, records, statistics, and classifications. Such forms of knowledge could facilitate public-health measures and political surveillance but remained selective and incomplete representations of local realities. This helps distinguish plague as represented through official reports from the more complex conditions encountered in administrative practice.

The concept of epidemiological uncertainty used in this study is grounded in the unsettled state of plague knowledge during the period rather than simply referring to administrative hesitation. Colonial officials knew relatively little about the etiology of the disease and that localist explanations continued to coexist with bacteriological interpretations (Kidambi, 2004), providing a plausible theory in a context of considerable uncertainty regarding the etiology of the plague. Similarly, Echenberg (2002) observes that much about plague still remained a mystery in 1900, although the plague bacillus had been identified and the role of rats and fleas was increasingly recognised; scientific consensus regarding transmission took more than a decade to emerge. Consequently, the period is characterised as one of turn-of-the-century confusion over plague causation, control, and therapy. In this study, epidemiological uncertainty is therefore identified where contemporary sources reveal competing explanations, unresolved observations, or inconsistencies between accepted theories and the actual behaviour of plague in Madras. These indicators are examined alongside legal authority and administrative capacity to assess how epidemiological conditions shaped variations in surveillance, intervention, and enforcement.

2.6 Research Gap and Contribution

Existing scholarship on plague governance in colonial India has focused on coercive intervention, public resistance, epidemiological knowledge, environmental conditions, and regional variation. Although recent studies have extended this literature to Madras and South India, the relationship between Madras's limited plague incidence, unresolved explanations for this pattern, and the nature and extent of colonial plague-control measures remains insufficiently examined.

This study addresses this gap by examining how epidemiological interpretations of plague and “immunity” interacted with legal powers, surveillance, administrative capacity, and selective intervention in colonial Madras. Rather than interpreting Madras as either an absence

of coercive plague governance or as a lesser version of the Bombay experience, the study argues that plague governance was regionally differentiated and selectively coercive, shaped by the city's particular epidemiological and administrative conditions. The study therefore contributes to the historiography of colonial epidemic governance by demonstrating that differences in disease incidence and epidemiological interpretation could influence the forms and intensity of administrative intervention.

3. Methodology

3.1 Research Design, Scope and Source Selection

This study adopts a qualitative historical research design with archival and documentary evidence to examine plague governance in Madras City. The focus period is from the outbreak of plague in India in 1896 to the early twentieth century. During this period, legislative acts were enacted for plague control measures and various medical commissions were constituted for epidemiological investigation. Madras, a commercially active port city, constitutes the principal geographical focus, while Bombay studies and data serve as a comparative reference for examining regional variation.

Primary sources, such as plague commission reports, administrative records, contemporary medical journals, colonial legislation and other medical and public health documents, were obtained from the Tamil Nadu Archives and Historical Research, Chennai, India, and supplemented by digitised materials from online repositories, particularly the Internet Archive. Source selection was based on its relevance to the Madras experience of plague and comparative studies. Detailed analysis excluded materials that did not contribute to Madras epidemiological and administrative studies. Greater importance was given to contemporary investigations that directly examined plague incidence in Madras. Secondary scholarship situates the primary evidence within broader historiographical debate.

3.2 Source Analysis and Interpretation

Collected materials were verified and examined to identify recurring themes, differences and contradictions in contemporary medical knowledge and discussion of plague in Madras. No single document was considered conclusive evidence. Conflicting explanations by colonial medical investigators were examined in specific contexts rather than reconciled

into a definitive explanation. The purpose and provenance of each document were assessed for the reliability of its evidence.

The analysis drew on evidence of implementation by colonial authorities, along with official policies and medical studies. Epidemiological uncertainty was identified through competing and contradictory explanations where a definite conclusion cannot be reached. This approach examined the limitations and disagreements in contemporary medical knowledge that influenced plague governance in Madras.

3.3 Comparative Framework, Limitations and Ethical Considerations

Bombay serves as a comparative reference rather than an equivalent case study. The comparison helps explain differences in plague incidence in Madras and colonial administrative practices. Governmentality is used to assess the colonial authorities' practical limitations in surveillance, inspection, regulation and documentation.

The study recognises the limitations of local experience because it is underrepresented in official records and often recorded indirectly. Reconstruction of plague incidence and administrative practice in Madras has also been limited by incomplete and uneven data. These limitations were addressed by comparing different categories of evidence. Since the study relies entirely on historical documentary materials, it does not involve any living person's participation or their personal data. The interpretation of historical sources was based on specific context and attributed appropriately.

4. Findings and Discussion

4.1 Madras as an Epidemiological Exception

Madras's distinctive epidemiological experience became apparent from the earliest years of plague in southern India. In 1897, Madras, "*which has hitherto been free from the plague,*" experienced an imported episode after servants returned with their employer from Poona. One servant died while travelling, while another was admitted to the General Hospital, where he subsequently died ("Plague in India," 1897, p. 1451). The diagnosis was confirmed through bacteriological examination when J. Nield Cook, Health Officer of Madras, obtained specimens and cultures of the plague bacillus. Surgeon-Captain Giffard and at least one hospital servant who had assisted him were subsequently infected; an imported case led to

further transmission ("Plague in India," 1897). In another account, an imported case was recorded involving a syce (horse groom) who travelled from Bombay to attend the Guindy Horse Races and succumbed to the plague in General Hospital. Two persons connected with the post-mortem examination were subsequently infected, one of whom also died. Colonial authorities stated, "*Precautions against the spread of infection were strictly carried out, and no further cases occurred*" ("Civil Hospitals and Dispensaries in Madras Presidency," 1899, p. 287). These early episodes of plague importation could produce subsequent secondary infection in Madras without transforming into a sustained urban epidemic.

The limited incidence of plague in Madras is better understood with comparative data from neighbouring territories. By June 1899, Hyderabad and Mysore both recorded more than 20,000 plague deaths, whereas the Madras Presidency, directly connected to both regions by road and rail, recorded only 2,092 deaths, with Madras city accounting for only eleven deaths (Low, 1900). Consequently, it was observed that "*the number of cases which resulted from the repeated importation of infection was relatively by no means large*" (Low, 1900, p. 59). This contrast indicates that although Madras were in regular communication with heavily affected neighbourhoods, it still did not produce comparable plague mortality.

The low incidence of plague in Madras did not deter colonial authorities from monitoring further importation of cases or identification of indigenous transmission. In October 1897, plague entered Madras city; sixty-seven imported cases subsequently occurred, and fifty-nine cases were directly detected through the passport system. A small indigenous outbreak was recorded in 1904, with eleven cases reported in the suburbs and five within Madras city (King, 1904a). In January 1906, stronger evidence emerged of indigenous plague transmission. The sanitary inspector of Madras investigated an unusual number of deaths in a fishing settlement in the northern outskirts of Madras, where three women were diagnosed with plague and bacteriological examination of rats in adjoining emigration depots found the infection among the rats (Ross, 1906). Although infected rats were identified, which was closely connected to the occurrence of human cases, the outbreak was geographically restricted; later investigation and surveillance found no further infected rats or additional human cases. Therefore, Madras faced both imported cases and indigenous transmission of plague from rats to humans, but it did not develop into a wider epidemic; this distinguishes Madras.

The limited transmission in the city can be better understood against the backdrop of substantial movement of people into the city. More than half a million people had arrived in Madras from plague-infected areas since 1898 under the passport system, and seventy passport holders developed plague during their observation period (Ross, 1906). Subsequent investigations provided further evidence of Madras's extensive connections with plague-affected regions. The 1912 investigation documented the scale of these connections, noting that maritime traffic linked the city with Rangoon, where plague was usually prevalent, while railway routes connected it with Bombay, Mysore, Bangalore, and other affected areas ("Plague in Madras City", 1912). Bangalore alone recorded 15,400 plague deaths between 1901 and 1909 while maintaining extensive passenger traffic with Madras. Despite these extensive connections with plague-affected regions, the investigators observed that, apart from the epidemic of 1905–1906, "*plague infection has never gained a foothold in the town, despite the fact that opportunities for importation appear to have been abundant since 1896*" ("Plague in Madras City," 1912, p. 207).

Contemporary medical investigators identified wider geographical unevenness in plague incidence across colonial India. The contemporary medical journal, *The Lancet*, reported that in some provinces epidemic transmission was established and, in some regions, it remained limited despite repeated importation of cases ("Anomalies of Plague Incidence in India," 1911). Regional variation was clearly evident from the contemporary mortality data. Comparing the Punjab, with a population half that of the Madras Presidency, which recorded 2.4 million deaths in the early twentieth century, with the Madras Presidency, with approximately 42 million, recorded fewer than 80,000 plague deaths. Madras City was described as having "*almost complete freedom from plague,*" while "*though the infection has been imported time after time there has been no spread of the disease in this city*" ("Anomalies of Plague Incidence in India," 1911, p. 837). Plague epidemics were shaped by interactions among various factors, including social conditions, mobility patterns, environment, and administrative response (Echenberg, 2007; Kidambi, 2004).

Madras, with a population exceeding half a million and substantial maritime and railway connections with plague-affected territories, recorded only 125 plague deaths during this period between 1896 and 1913, apart from a limited epidemic in 1905–1906 ("City of Madras and Its Immunity," 1913). During these periods, Bombay recorded 178,440 plague deaths and Calcutta more than 61,000 plague deaths; consequently, contemporary accounts

observed that “*in spite of these and other opportunities for contracting the infection Madras has, with the slight exception mentioned above, remained free from epidemic plague during the past 17 years*” (“City of Madras and Its Immunity,” 1913, p. 841).

Plague incidence also differed across the Madras Presidency. Kunhardt and Taylor (1915) recorded that during the 1905 outbreak in Madras, only 78 plague deaths, whereas Bellary and Salem recorded 31,510 and 13,312 plague deaths, respectively. Further investigation by the colonial authorities observed that “*though more than 100 cases of plague are known to have entered the city, no epidemic developed in connection with them*” (Kunhardt & Taylor, 1915, p. 711). Plague mortality within the Madras Presidency also reinforces this contrast through the geographical concentration of plague impact. Ninety per cent of the plague deaths in the Madras Presidency were concentrated in the district adjoining the heavily affected areas in Bombay and Mysore, while the disease showed “*little tendency to spread beyond the limits already indicated.*” The report further notes that plague had “*rarely occurred on the east coast*” of colonial India (“Plague Investigations in India,” 1915, p. 240). Thus, the aggregated mortality figure of the Presidency should not be considered as a whole for plague incidence and its effects; rather, the experience of Madras city should be understood within broader regional differences.

By 1915, epidemiological investigation had become an important tool for understanding the limited incidence of plague in Madras. The *Journal of the American Medical Association*, a contemporary account, noted that “*To account for this immunity has been one of the many problems confronting the British commission appointed to deal with the plague in India*” (“Climate and the Distribution of Plague,” 1915, p. 1162). Rather, repeated importation, documented human and rat infection, and extensive connections with plague-affected regions coexisted with comparatively limited epidemic mortality. The historical problem, therefore, was no longer whether plague reached Madras, but why repeated introductions, documented local transmission, and conditions capable of supporting infection failed to produce epidemics on the scale recorded elsewhere. Contemporary investigators increasingly turned to this unresolved question, testing climatic, ecological, biological, and administrative explanations.

4.2 Limits of Colonial Epidemiological Knowledge

The difficulty in accounting for Madras’s comparatively limited plague incidence did not stem from a lack of contemporary knowledge about disease transmission. By the early

twentieth century, colonial investigations of plague increasingly focused on the role of rats and fleas in transmission. In 1915, the evidence connecting bubonic plague among rats with transmission to humans through rat fleas was described as “overwhelming” (“Climate and the Distribution of Plague,” 1915, p. 1162). The difficulty in explaining the Madras experience was therefore more specific. Although recognised mechanisms of plague transmission were present in the city, they did not fully explain its comparatively limited incidence. This problem was already acknowledged in 1911 in *The Lancet*, where a contemporary account noted that the causes of the uneven distribution of plague in India “*have so far remained undiscovered*” and characterised the contrasting experiences of the Punjab, Madras Presidency, and Eastern Bengal and Assam as “*problems still unsolved*” (“Anomalies of Plague Incidence in India,” 1911, p. 837). Therefore, uncertainty about plague transmission centred on the marked difference in epidemiological outcomes across regions despite several conditions being similarly associated with epidemic spread.

Understanding plague through environmental and epidemiological lenses was not unique to Madras. Secondary scholarship studies about plague in Calcutta and Hong Kong show that, despite the discovery of the plague bacillus, it did not produce an immediate scientific consensus on the question of the location aspect of infection and methods of preventing it; thereby, germ theories coexisted along with earlier understanding of established environmental and sanitary interpretations (Sutphen, 1997). In Madras, investigators examined these explanations against local conditions to account for the city's comparatively limited incidence of plague. Housing conditions offered no satisfactory explanation, as large sections of the city contained poorer dwellings that provided ample shelter for rats, yet their construction was not considered sufficient to account for Madras's apparent immunity from plague (“Plague in Madras City,” 1912).

Evidence from the investigation of rats and fleas further complicated attempts to explain Madras's limited plague incidence. Investigators identified *Mus rattus* as the predominant house rat, and rat infestation levels in the city were not substantially lower than those recorded in plague-affected places such as Poona, Belgaum, and Parel (“Plague in Madras City,” 1912). The flea investigation identified *Xenopsylla cheopis* as practically the only flea species found on Madras rats. Although the maximum flea burden was lower than in several heavily infected localities, investigators explicitly cautioned that “*it cannot be considered that the relative paucity of fleas in Madras constitutes a necessarily effective*

obstacle to the establishment and prevalence of plague infection” (“Plague in Madras City,” 1912, p. 219). Later comparative evidence reinforces the importance of this finding. *Rattus rattus* among rodents and *Xenopsylla cheopis* among fleas were identified as “*the two most important elements in urban human plague infection in India*,” while *R. rattus* constituted 49.4 per cent of the Madras sample compared with 66.2 per cent in Bombay (Seal, 1960, p. 293).

Madras apparent immunity was further complicated by the experimental evidence on rat susceptibility. A controlled experimental investigation on rats revealed that 83 per cent of Madras rats died due to plague compared with the 44 per cent of Bombay and 30 per cent of Poona rats, consequently concluding that “*Madras rats therefore were highly susceptible to the disease; Bombay and Poona rats comparatively immune*” (“Immunity of the Wild Rat,” 1912, p. 231). Colonial investigators led a larger series of experiments to better understand rat susceptibility. Eighteen experiments comparing Madras, Bombay, and Poona produced a similar result: a high mortality rate for Madras rats (“Immunity of the Wild Rat,” 1912). These experimental findings reveal that the earlier assumption of limited plague incidence in Madras, with unusual resistance among the rat population, was an insufficient argument. At the same time, a colonial laboratory investigation in a controlled environment cannot be generalised to complex tropical environments, where disease patterns and transmission may differ (Anderson, 2006).

The earlier investigation in Madras City was associated with the rats and fleas being unfavourable to plague and geographical aspects determining the difficulties in introduction of infection, but despite this investigation “*no single outstanding circumstance was discovered which could account for the freedom of the city from plague*” (Kunhardt & Taylor, 1915, p. 683). The investigations recognised that the rat and fleas were less numerous compared with the heavily affected region, but it was sufficient to establish plague transmission in the city, and findings reveal Madras rats are susceptible; consequently, they concluded that these facts offered “*no satisfactory explanation of the immunity of Madras to plague*” (Kunhardt & Taylor, 1915, p. 683). The colonial investigators found the epidemiological factors examined in Madras insufficient to explain the limited incidence. This also reflected a broader feature of bacteriological thought in colonial India, where bacteriological knowledge continued to coexist with geographical, environmental, and locally specific explanations of disease (Chakrabarti, 2012; Bhattacharya, 2012). This helps explain why investigations in Madras

continued to examine climate, ecology, and other local conditions even after the roles of rats and fleas in plague transmission had become increasingly well established.

Climate therefore remained an important alternative explanation, although the available evidence did not support a straightforward conclusion. The India Plague Commission regarded the physical and climatic conditions of the Madras Presidency as potentially important influences on the distribution of plague, particularly because high temperatures and dry conditions could reduce the survival of rat fleas after separation from their hosts (“Climate and the Distribution of Plague,” 1915). Climate was therefore proposed as a partial explanation for Madras's limited plague incidence, with the suggestion that “*plague-free Madras may thus owe its comparative immunity in part to the warm climate,*” although the account also acknowledged that it is difficult to estimate the relative importance of climatic influences and opportunities for the transportation of infection (“Climate and the Distribution of Plague,” 1915, p. 1162). Evidence from Madras City itself further complicated climatic explanations. Ross (1906) observed that plague had spread vigorously within a limited part of the city during months that were not particularly cold, thereby questioning whether high temperature alone could account for Madras's comparatively limited incidence. Based on these observations, it was estimated that, had the disease spread throughout the city at a similar rate, at least seventy attacks might have occurred each day (Ross, 1906). Climate could therefore have influenced plague transmission, but it did not, by itself, explain why the disease remained geographically restricted within Madras.

Other possibilities were also considered, including preventive surveillance and the behaviour of the city's rats. In considering the possible effects of preventive surveillance, it was suggested that the passport system may have helped prevent imported human cases from transmitting infection to neighbouring rats. However, Ross (1906) found it difficult to believe that passporting alone could have been so successful along the East Coast while proving less effective elsewhere in India. An alternative explanation centred on the behaviour of the city's *Mus rattus* population, which tended to remain within individual houses rather than move extensively between them. The suggestion that “*the rats of each house are a separate community,*” which controlled infection from transforming into a wider epidemic, consequently, Madras's limited incidence of plague is “*intimately bound up with the habits of our rat population*” (Ross, 1906, p. 277). These statements are important because broader

climatic and administrative explanations are insufficient; therefore, colonial investigators used specific ecological factors to explain plague in Madras.

Continued investigation did not resolve the difficulty of explaining Madras's limited plague incidence. In 1913, the Advisory Committee concluded that Madras “*is not immune to the disease in the sense that the prevailing conditions are such that plague could not become established in it*” (“City of Madras and Its Immunity,” 1913, p. 842). The investigators considered whether infection had failed to reach Madras when meteorological and flea conditions favoured transmission or whether some unidentified factor had prevented its establishment after introduction. Since neither possibility could be established conclusively, they deferred a definitive explanation pending more detailed investigation of plague across the Presidency (“City of Madras and Its Immunity,” 1913). The investigators nevertheless found it difficult to determine the relative importance of the different factors that either encouraged or restricted the spread of infection (Kunhardt & Taylor, 1915). The Ninth Report similarly found susceptible rats in localities that had remained free from plague epidemics, while acknowledging that the conditions responsible for preventing the establishment and spread of infection remained difficult to identify (“Plague Investigations in India,” 1915). Despite continued investigation, no single explanation satisfactorily accounted for the uneven incidence of plague across the Presidency.

The available records complicate epidemiological interpretation because plague cases may have been recorded incorrectly due to misidentification of other illnesses such as plague; therefore, colonial investigators largely relied on mortality rates to construct the geographical distribution of plague across the Presidency (Kunhardt & Taylor, 1915). These limitations indicate that the statistical evidence does not provide a complete record of plague incidence. Considering these factors, plague investigation struggled not because of a lack of transmission knowledge, but because it could not identify the epidemiological factor in providing a satisfactory explanation for limited plague incidence in Madras. This unresolved epidemiological problem shaped the context within which colonial authorities monitored and controlled plague in Madras.

4.3 Legal Powers, Administrative Capacity and Selective Governance

Plague administration in Madras operated within a legal framework that authorised extensive intervention. The 1897 Epidemic Diseases Act empowered provincial governments

to introduce temporary measures when existing legal provisions were considered insufficient, including inspecting travelers and segregating persons suspected of infection. Disobedience of regulations issued under the Act was punishable under Section 188 of the Indian Penal Code (*Epidemic Diseases Act*, 1897, Sections 2–3). The Act therefore provided colonial authorities with considerable powers of intervention, but the existence of these powers does not indicate the extent to which they were exercised in Madras. The character of plague governance in the city must therefore be examined through how these legal powers were implemented in practice.

Evidence from the Madras Presidency indicates that regulating movement became an important component of plague control. Low (1900) documented a range of measures, including medical inspection, the detention of suspected travellers, segregation of contacts, evacuation and disinfection of infected houses, inoculation, and the passporting of persons arriving from plague-affected areas. The passport system extended surveillance beyond the initial inspection of travellers, requiring those permitted to continue their journeys to report daily for ten days while their names and addresses were forwarded to local authorities for verification (Kunhardt & Taylor, 1915). Information concerning imported cases circulated through district officials, the Sanitary Commissioner, and the Presidency government, forming what was described as “*The Intelligence Branch*” of the plague-control organisation and enabling threatened localities to be placed under special observation (Kunhardt & Taylor, 1915, p. 746).

The scale of railway inspection was considerable. In 1897, five plague inspection stations in Madras Presidency examined an average of 3,313 passengers each day. Altogether, 4,721 trains were inspected, while 676 persons who had travelled through plague-affected areas were detained for observation (“Civil Hospitals and Dispensaries in Madras Presidency,” 1899). At Jalarpet, a major railway junction in Madras Presidency, colonial authorities examined approximately 225,000 passengers between August 1898 and July 1899; nearly 11,500 were detained for observation, and 66 were diagnosed with the plague (Low, 1900). Similarly, King (1904a) reported that in 1903 alone 79,488 passports were issued for screening and tracing of travelers. The surveillance system included coercive measures. Medical inspectors were empowered to detain trains and compel passengers to undergo examination with police assistance; suspected passengers could be detained at observation camps, and non-compliant passengers could be imprisoned, fined, or both (Low, 1900). Authorities can trace suspected passengers' contacts, and they can be detained for ten days in camps under medical

supervision, with police or sepoy guards restricting communication (Low, 1900). An earlier imported case became a secondary infection for Surgeon-Captain Giffard; his household was “*rigorously segregated*” (“Plague in India”, 1897, p. 1451). The distinction in enforcing coercive and non-coercive plague control measures depended on the particular epidemiological circumstance.

The coercive measures undertaken by the colonial authorities are evident in the 1905-1906 epidemic outbreak in Madras. Residents of infected localities were evacuated, the adjoining emigration depot was cleared, one infected village was burned, temporary camps were established for displaced inhabitants, houses were disinfected, and measures were taken to destroy rats (Ross, 1906). At Handcock Parcherry, a local settlement in Madras, evacuation was “*strictly insisted upon*” for one night, while a rat-extermination method described as the “*Commonsense Rat Exterminator*” was placed in the empty house to capture and destroy rats (Ross, 1906, p. 275). Yet these episodes also revealed limits to coercive enforcement. When a cordon was imposed and residents needed passes to leave an affected locality, local cooperation ceased, and even doubling the rewards for captured rats failed to restore participation (“Plague in Madras City,” 1912). Restrictive measures could therefore undermine other aspects of plague control that depend upon local cooperation.

The implementation of plague measures also varied according to local cooperation. While officials encountered persistent opposition, concealment, and obstruction at Cassimode Kuppam (a fishing settlement), residents of another affected settlement cooperated with measures to destroy rats (Ross, 1906, pp. 275–276). Although the Special Plague Staff destroyed approximately 25,000 rodents and subsequent efforts increased the number considerably, difficulties in developing an effective method of rat extermination remained, and local cooperation was considered essential (Ross, 1906). Similar considerations influenced the isolation of plague patients, which was not recommended when their relatives and friends strongly opposed it (Ross, 1906). These incidents reveal the difficulties colonial authorities faced in enforcing plague control when local opposition arose.

The passport system adopted for plague surveillance similarly faced limitations in administrative actions and people's cooperation. Designated municipal officers monitored passengers travelling from infected areas with the support of the passport system; nevertheless, the system was acknowledged to be “*far from infallible*” (King, 1904a, p. 490). Passengers with passports attempted to evade inspection and surveillance by leaving trains before reaching

their designated stations, concealing their house details, hiding beneath the railway seats, and borrowing or purchasing inoculation certificates (Low, 1900). Similarly, a 1912 investigation described the difficulty of assessing the passport system's effectiveness, noting that “*a fair number of infected persons appear to escape its surveillance*” (“Plague in Madras City,” 1912, p. 220). Surveillance methods were extensive but incomplete in practice because of practical difficulties such as inadequate human and administrative resources (Bulmuş, 2012).

The effectiveness of plague administration depended on the medical personnel and sanitary workforce. During certain periods, the presidency withdrew military and medical personnel from plague measures and placed them in frontier service. During those periods, the health administration relied on senior civil assistant surgeons, retired medical assistants, and qualified private practitioners (“Civil Hospitals and Dispensaries in Madras Presidency,” 1899). By 1904, Madras Medical College produced 571 qualified sanitary inspectors, but the workforce remained inadequate; administrators therefore recruited temporary sanitary workers specifically for plague duty (King, 1904b). Their recruitment was described as “*a temporary expedient*,” while their risks were evident and acknowledged: “*Several have died of plague within a very short period of service*” (King, 1904b, p. 438). These limitations reflect the constraints faced by the colonial authorities in implementing effective medical intervention in British India (Harrison, 1994).

Plague governance in Madras shows that it had extensive legal authority, but it enforced its powers selectively. Colonial authorities' powers include segregation, detention, destruction of infected houses, prosecuting violations and deploying specialised officers for monitoring. In practice, the limited incidence of plague in Madras led the administration to rely on the passport system, inspection, and cooperation from the local population. These measures also faced constraints from resistance, evasion, staff shortages, and challenges in monitoring surveillance over the mobile population. Therefore, plague governance in Madras cannot be considered coercive or non-coercive, or uniformly coercive; rather, it should be understood through the lens of administrative capacity, local epidemiological conditions, and public cooperation.

4.4 Constructing “Immunity” under Conditions of Uncertainty

Contemporary medical investigators considered Madras's immunity to require an adequate explanation. The plague incidence in Madras was observed not to have spread to any

appreciable extent despite favourable conditions to establish a wider epidemic, and investigators termed it as “*the sanitary condition of towns in Madras is not sufficient to explain this immunity*” (Low, 1900, p. 77). Similarly, Ross (1906) suggested investigating and identifying the reasons for plague immunity in Madras and the East Coast generally. By 1912, investigations in Madras were undertaken explicitly “*to throw light on this apparent immunity*” (“Plague in Madras City,” 1912, p. 207). Therefore, immunity was identified as an epidemiological pattern that required investigation rather than an established explanation for the limited incidence of plague in Madras.

Initially, contemporary investigators observed apparent immunity to plague in Madras but questioned whether it was related to any inherent protection. King (1904a) observed that the city's immunity could not be understood and argued that nothing inherent in Madras protected against disease. It was reported that the Rats from the city of Madras had “*practically escaped the ravages of this disease*” (“Immunity of the Wild Rat,” 1912, p. 230). A subsequent comparative investigation of rats from Madras with those from other heavily affected regions, such as Bombay and Poona, found them highly susceptible to plague. These findings complicated the biological description of immunity in the Madras experience.

Later investigations became cautious about using the language of immunity. The Ninth Report referred to the “*comparative immunity of the city of Madras*” and described that the experience of plague in Madras was less than in the other regions and could not be considered as completely immune (“Plague Investigations in India,” 1915, p. 240). The discussion was also centred on plague control measures for the limited incidence. But it was not considered strong evidence, and in contemporary investigation it was reported that limited plague in Madras was “*not altogether because of the measures which have been adopted to prevent its spread during the present pandemic but largely owing to climatic or other peculiarities*” (“Climate and the Distribution of Plague,” 1915, p. 1163). Differing explanations indicate that the term immunity increasingly qualified from apparent to comparative immunity, and the cause behind the immunity remained open to different interpretations.

The language of “Immunity” can be understood as historically contingent, as contemporary investigators used the term to interpret and explain the limited plague incidence in Madras. Despite the favourable conditions for the establishment of plague in Madras, investigators could not identify any single biological or epidemiological framework for why it did not develop into a wider epidemic. Competing interpretations based on climate, rat-related

biological factors, and plague measures could not provide conclusive evidence. The construction of Madras's "immunity" reflects the colonial investigators' attempt to explain the regional epidemiological difference compared with the severely affected region.

5. Conclusion

The evidence demonstrates that the Bombay-centred method failed to be a universal means of controlling plague in Madras. Plague entered Madras as an import, and its transmission remained slow and local despite its connection with the heavily infected neighbouring regions. It did not evolve into an epidemic.

Contemporary investigators examined housing, climate, environment, and rat biology, and they recognised the major features of plague transmission. Yet these factors did not explain the limited transmission of plague in Madras; indeed, experiments on rats explained the high susceptibility, thereby complicating explanations of apparent immunity. Therefore, contemporary epidemiological knowledge exposed the limitations of the colonial scientific establishment, its knowledge, and its understanding of plague behaviour.

The low incidence of plague and condition of Madras shaped the nature and intensity of intervention. As a universal method, coercion consisting of segregation, evacuation and detention was employed against the plague; its actual success was limited by inadequate staff, evasion and resistance by the natives. Therefore, coercive legal authority did not produce uniform coercive practices, and there was significant distinction between power and practical outcome. Colonial investigators have also used the language of immunity to explain the limited plague incidence in Madras. Later, they qualified the term as apparent or comparative immunity. Epidemiological investigations could not establish a single or definitive biological immunity for the city's experience. Therefore, constructing immunity became a way to identify and interpret an epidemiological anomaly that remained unresolved.

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