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# Science, Technology, Medical Systems, and Digital Historiography: A Case Study of Aurangabad's Smart Responses to COVID-19

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**Abstract:**

*This study investigates Aurangabad's innovative response to the COVID-19 pandemic through the integration of digital methodologies, advanced technological interventions, and smart governance strategies. Utilizing a mixed-methods approach, the research combines quantitative data from official records with qualitative insights from stakeholder interviews to explore how digital historiography has transformed public health crisis management. Key initiatives such as the establishment of a COVID-19 War Room, the deployment of the Mazi Health Mazya Hathi (MHMH) App, and data-driven surveillance measures are examined to assess their impact on urban governance and healthcare delivery. The findings reveal that the strategic use of digital tools—including Geographic Information Systems (GIS) and Electronic Medical Records (EMRs)—significantly improved crisis management, resource allocation, and patient outcomes. This study contributes valuable insights into the role of technology in pandemic preparedness and offers a framework for enhancing future urban resilience.*

**Keywords:** Digital Historiography, COVID-19, Urban Governance, Digital Surveillance, Aurangabad City Model, Public Health, Pandemic Management.

## 1.1 Introduction:

Human civilization has continuously sought to understand historical events to make sense of present and future challenges. The COVID-19 pandemic emerged as one of the most defining moments of the 21st century, affecting millions globally and reshaping urban governance. According to the Ministry of Housing and Urban Affairs (MoHUA, 2020), the pandemic was one of the most significant global challenges since World War II.[1] In this order, digital historiography, the application of digital tools and methods to the study of history, has significantly transformed the fields of science, technology, and medical systems. With leveraging computational techniques, researchers can analyze vast datasets, uncover patterns, and present historical narratives in innovative ways.[2]

The integration of digital methodologies into the historiography of pandemics has opened new avenues for research, enabling historians and scientists to access and analyze extensive collections of documents and data. Digital archives and databases facilitate a more comprehensive understanding of past pandemics, offering insights that inform current public health strategies.[3]

### 1.2 Science and Technology:

Digital tools such as Geographic Information Systems (GIS) and text mining have become integral in examining historical pandemic data.[4] These technologies allow for the visualization of spatial relationships and the extraction of patterns from large textual datasets, providing deeper insights into the spread and impact of diseases.[5] For instance, the "American Influenza Epidemic of 1918: A Digital Encyclopaedia" offers detailed narratives and primary sources that help researchers explore the societal and technological responses to the 1918 influenza pandemic.[6]

### 1.3 Medical Systems:

In the realm of medical history, digital historiography has facilitated the preservation and analysis of medical records, leading to improved patient care and research.[7] The transition from paper charts to Electronic Medical Records (EMRs) exemplifies this shift, enhancing efficiency, accuracy, and accessibility in healthcare documentation.[8] Moreover, initiatives like the "1918 Influenza Digital Archive" by the University of Michigan provide open-access collections of archival materials related to past pandemics, making them accessible to researchers worldwide and fostering a more inclusive understanding of medical practices and their evolution over time.[9]

### 1.4 Digital Historiography:

The advent of digital historiography has transformed traditional historical research methodologies. By utilizing digital tools, historians can manage and analyze large datasets, visualize complex information, and disseminate findings to a broader audience.[10] This transformation is evident in projects like the "Pandemics, Society, and Public Health, 1517–1925" collection, which collates archival materials related to the history of pandemics, offering multidisciplinary perspectives and facilitating a deeper understanding of societal responses to health crises.[11] However, the digital turn in historiography also presents challenges, including issues of data preservation, the need for new skills among historians, and ethical considerations regarding digital data use.[12] Addressing these challenges requires ongoing collaboration between historians, technologists, and policymakers to ensure that digital historiography continues to enrich our understanding of pandemics and inform future responses.

## 2. Setting of the Proposed Study: (Aurangabad) Chhatrapati Sambhajinagar City:

Known as "The Tourism Capital of Maharashtra," Aurangabad is a historically rich city in the state of Maharashtra, India.[13] It is a home to the Ajanta and Ellora Caves, two UNESCO World Heritage Sites designated in 1983. Other notable attractions include Daulatabad Fort, Grishneshwar Temple, Jama Mosque, Himayat Bagh, Panchakki, and Salim Ali Lake. Historically, Aurangabad was fortified with 52 gates, earning it the nickname "City of Gates.[14] It also serves as the administrative headquarters of Aurangabad district and is the largest urban center in the Marathwada region. Situated on hilly terrain in the Deccan plateau, Aurangabad is the fourth-most populous urban area in Maharashtra, with a population of 11,75,116.[15]

City Administration and its municipal administration had to swiftly transform and adapt to manage the COVID-19 crisis. This was achieved through a combination of monitoring,

surveillance, strengthening medical health infrastructure, and ensuring the provision of essential services for those in need. Maintaining the city's essential services—such as water supply, electricity, sanitation, food distribution, and other life-saving necessities—posed a significant challenge for the administration. Despite these difficulties, efforts were made to sustain the city's functioning while addressing the unprecedented health crises.[16]

This paper aims to document and analyze Aurangabad's smart responses to COVID-19 by exploring:

1. The role of technology and digital governance in crisis management.
2. The efficiency of medical and healthcare infrastructure in responding to the pandemic.
3. The impact of data-driven surveillance, contact tracing, and risk mapping.
4. The role of digital historiography in preserving pandemic-related urban governance measures.

### 3.1 Research Methodology:

This study employs a mixed-methods approach, integrating both quantitative and qualitative data to ensure a comprehensive analysis of Aurangabad's pandemic response. The research draws upon official reports, government documents, and empirical data collected during the COVID-19 crisis. This methodology enables a holistic understanding of the effectiveness of digital governance, medical infrastructure, and pandemic management strategies implemented in the city.

### 3.2 Data Collection

To ensure a comprehensive analysis, data for this study was collected through both primary and secondary sources:

1. Primary Data

- Information obtained from interviews and questionnaires conducted with key stakeholders.
- Digital records from the COVID-19 War Room in Aurangabad, documenting real-time pandemic management efforts.

2. Secondary Data

- Surveillance and contact-tracing data from the Aurangabad Municipal Health Department to track and control infections.
- Data from the My Health My Hand (MHMH) App, a pandemic management application used for self-monitoring and patient tracking.
- Government publications from the Ministry of Housing and Urban Affairs (MoHUA), the World Health Organization (WHO), and the Ministry of Health & Family Welfare (MoHFW), India.
- Reports from the World Resources Institute (WRI) and the National Institute of Urban Affairs (NIUA), offering insights into urban governance and pandemic response strategies.
- Articles and research papers focusing on smart city pandemic responses and the role of digital surveillance in crisis management.

### 3.3 Sample Selection

A purposive sampling method was employed to ensure that participants with relevant expertise and experience were included. The sample comprised:

- 45 corporators
- 10 health experts

- 10 media personnel
- 10 officers

This selection ensured a diverse and informed perspective on the implementation of COVID-19 response strategies in Aurangabad.

### 3.4 Study Period:

The research covers the timeframe from February 2020 to December 2022, capturing the evolving nature of the pandemic, the response measures, and their long-term impact on urban governance and public health management.

## 4. Technology-Driven Governance & Digital Surveillance:

The response of Aurangabad to the COVID-19 pandemic was marked by significant technological interventions, leveraging digital tools, real-time data analytics, and innovative infrastructure solutions to mitigate the impact of the crisis.[17] Below are the key technological strategies employed by the city administration: Aurangabad effectively leveraged technology to combat COVID-19 through:

### 4.1 COVID-19 War Room [17]

The first COVID-19 case in Aurangabad was detected on March 13, 2020. Given the novel nature of the virus, there were limited guidelines and no established treatment protocols at the time, leading to widespread fear and uncertainty. As the crisis escalated, it became evident that a war-footing approach was necessary to control the pandemic. To address this challenge, under the leadership of Commissioner Astik Kumar Pandey, the War Room was established on May 11, 2020. Similar to military operations, where command, control, and execution are managed from a central location, the War Room served as the nerve center for patient tracking, hospital admissions, swab collection, data management, and timely reporting to government authorities.

To coordinate and manage all COVID-19-related tasks through a centralized system, ensuring swift decision-making and effective response.

i. A centralized command center for real-time pandemic monitoring and decision-making.
ii. Coordinated with Cyber Police for digital contact tracing.
iii. Live updates on positivity rates, testing, vaccination, and hospital occupancy.

### 4.2 Policies & Initiatives [18]

During the COVID-19 pandemic, effective patient management was crucial to control the virus's spread. Policies and initiatives focused on promptly informing patients of their test results, coordinating ambulance services for immediate hospital admissions, and diligently tracking and quarantining high-risk contacts to prevent further transmission. The following policies and initiatives were implemented by the city administration during COVID-19 mitigation, based on direct interviews with concerned officials and their official order

1. **Patient Management:**
   - Patients were informed of their swab test results and directed to the nearest COVID-19 hospital based on their symptoms.
   - Ambulance services were arranged for prompt admission.
   - High-Risk Contacts (HRCs) of infected patients were tracked and quarantined.
2. **Early Detection & Testing (Catch Earlier Strategy):**
   - Swab tests were conducted for high-exposure groups such as traders, vegetable vendors, meat sellers, salon operators, and milk vendors.

- A call center was established to follow up on high-risk individuals.

## 5. Health Monitoring & Public Awareness [19]

### 1. Call Center:

- Patient health was monitored, particularly among senior citizens and those with comorbidities.
- Post-COVID complications such as Mucormycosis in adults and Multisystem Inflammatory Syndrome (MIS) in children were tracked.
- Eligible citizens were contacted for their second vaccine dose.

### 2. Awareness Campaigns:

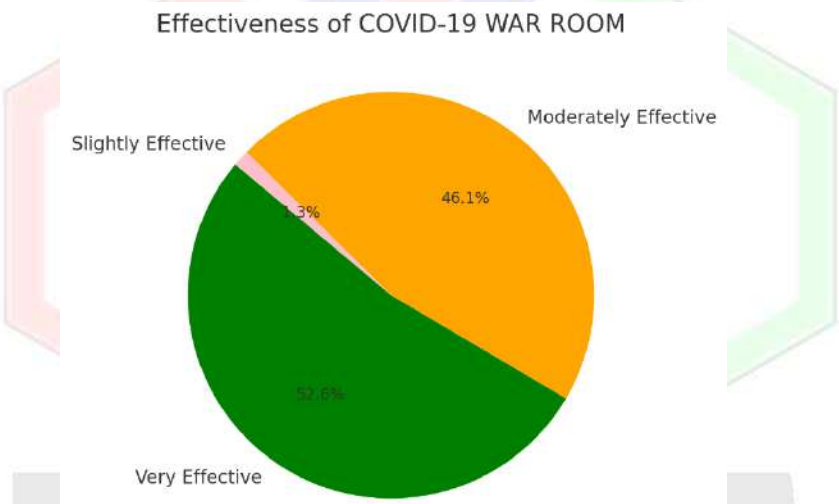
- Facebook Live and other media platforms were used to update the public on the COVID-19 situation, hospital bed availability, and vaccination drives.

### 3. 24x7 Helpline:

- The COVID-19 Helpline (8956306007) provided round-the-clock assistance and guidance via email and in-person support.

### 4. Psychosocial Support:

- The Manomitra Cell was established to provide mental health counselling to patients and their families.




## 6. Mazi Health Mazya Hathi (MHMH) App [20]

Launched on May 27, 2020, the Mazi Health Mazya Hathi (MHMH) app was India's first pandemic management application. It empowered citizens to self-monitor their health by updating personal details such as name, age, address, temperature, oxygen level, pulse rate, and comorbidities. This information enabled the War Room to track and prioritize high-risk individuals effectively.

### 1. Key Features:

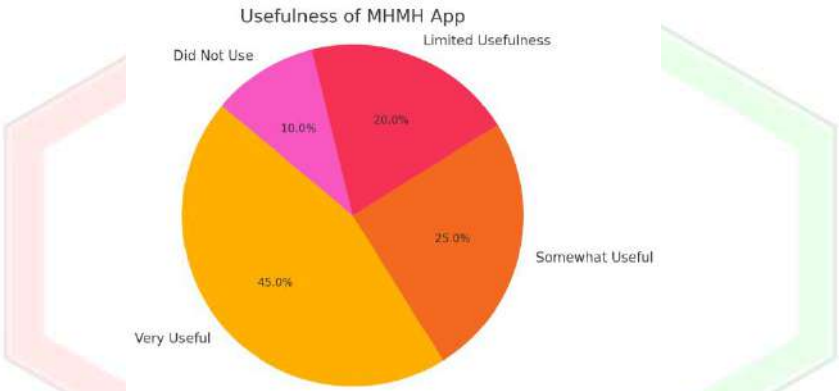
- Self-Health Assessment: Users could regularly input health metrics to monitor their well-being.
- Real-Time Bed Availability: The app provided up-to-date information on hospital bed availability, including ventilators, oxygen beds, and ICU beds, with updates refreshed 4-6 times daily during the second wave.

- Plasma Donor Registry: Details of plasma donors were accessible to those in need.
- Swab Center Listings: Locations of swab centers were provided for easy access to testing facilities.
- Vaccination Centers: Information on vaccination centers was integrated with Google Maps for user convenience.

**2. Mobile Fever Clinics** [21]

- 1,000 mobile clinics were deployed across the city for door-to-door health screening.
- Used thermal guns and oximeters for early detection of COVID-19 cases.
- Collected data directly linked to the MHMH app for monitoring.

Frontline health workers utilized the MHMH app to monitor high-risk individuals, enhancing the efficiency of pandemic response efforts. Developed by a startup incubated by Aurangabad Smart City Development Corporation Limited (ASCDCL), the app played a pivotal role in the city's COVID-19 management strategy. The MHMH app exemplifies how digital tools can be leveraged to manage public health crises effectively, providing real-time data and resources to both citizens and health authorities.




During the COVID-19 pandemic, Aurangabad implemented a series of strategic measures to monitor and control the virus's spread within the city. These initiatives encompassed entry point surveillance, data-driven contact tracing, risk mapping, and innovative vaccination and treatment approaches.

**7. Entry Point Surveillance** [22]

In July 2020, Aurangabad authorities established continuous monitoring at six key entry points to the city. Travelers were systematically screened, and their information was recorded in an electronic database to ensure accurate tracking. Regular testing protocols were instituted for industrial workers commuting daily, aiming to detect and isolate potential cases promptly. The surveillance system incorporated thermal scanners and mobile data tracking, creating digital logs of movement to enhance monitoring efforts. This proactive approach led to the identification of COVID-19 positive individuals at city entry points, facilitating immediate quarantine measures.

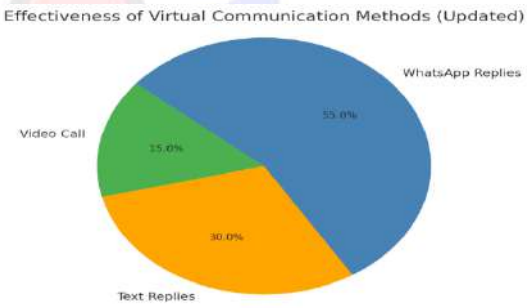
**8. Data-Driven Contact Tracing and Risk Mapping** [23]

On April 22, 2020, a specialized task force was formed, including experts from the Aurangabad Cyber Cell, to enhance contact tracing efforts. Utilizing mobile tower data and

comprehensive field surveys, the team tracked primary and secondary contacts of confirmed cases, categorizing them into high-risk and low-risk groups. This data-driven approach enabled precise identification and monitoring of individuals potentially exposed to the virus. Additionally, geospatial analysis combined real-time field data with digital mapping techniques to pinpoint emerging hotspots, allowing for targeted interventions. Public awareness campaigns were also launched, leveraging social media platforms, local influencers, and community leaders to promote initiatives like 'My Ward, Corona-Free Ward,' encouraging collective responsibility in combating the pandemic.

**9. Communication with the help of Technology** [24]

During the COVID-19 pandemic, virtual meetings became essential for effective communication and decision-making among stakeholders. Regular video conferences involving corporators, government officials, healthcare administrators, and other key participants facilitated the coordination of pandemic response efforts, resource allocation, and monitoring of COVID-19 cases. This approach ensured efficient governance at the ward level while minimizing physical interactions to reduce virus transmission. By leveraging virtual platforms, authorities maintained real-time collaboration, transparency, and swift decision-making, leading to a proactive and well-coordinated response to the pandemic.




The Commissioner virtually interacted with various stakeholders.

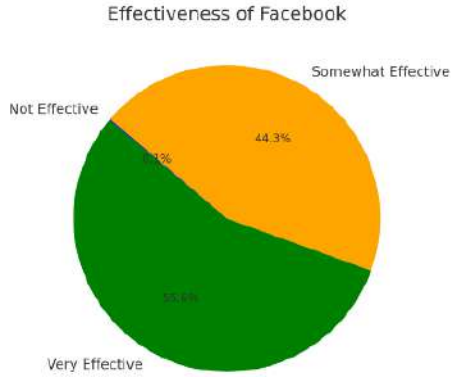
**10. Facebook Lives of Municipal Commisioner and Video Updates: Enhancing Public Trust and Communication** [24]

The efficient use of social media, particularly Facebook Live and video updates, played a crucial role in keeping citizens informed, building public trust, and providing essential instructions during the COVID-19 pandemic.

. These digital platforms were leveraged to:

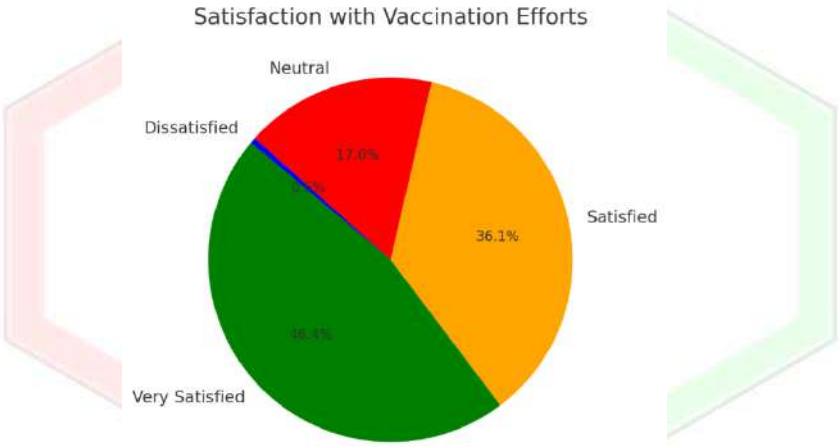
- Deliver real-time updates on COVID-19 cases, hospital bed availability, and vaccination drives.
- Address public concerns and dispel misinformation, fostering a sense of transparency and trust.
- Provide clear guidelines and safety instructions to ensure community compliance with health protocols.
- Engage with citizens interactively, allowing them to ask questions and receive immediate clarifications from authorities.

This approach significantly improved public awareness and civic participation, making social media an integral tool in Aurangabad's smart response to COVID-19.




## 11. Innovations in COVID-19 Vaccination and Treatment [25]

To bolster vaccination efforts, the 'My Ward, 100% Vaccinated Ward' initiative was introduced, wherein public representatives collaborated to ensure comprehensive vaccination coverage within their localities. Data analytics were employed to identify areas with lower vaccination rates, facilitating focused outreach. Furthermore, drive-in vaccination centers were established, notably at Prozone Mall, offering contactless vaccination services. These centers utilized QR code-based tracking systems to maintain authenticity and streamline the vaccination process.



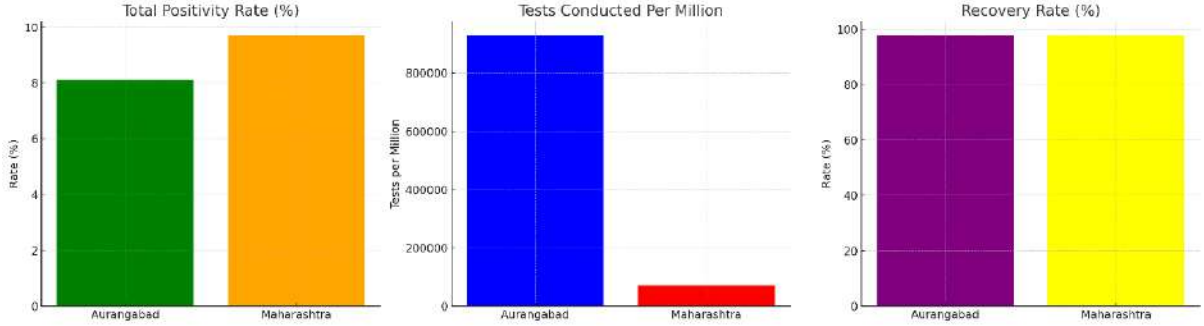

## 12. Major Findings

The study on Aurangabad's smart response to the COVID-19 pandemic highlights the effective integration of technology, data-driven governance, and medical systems in crisis management. The key findings include:

- A master database of COVID-19 patients have been developed within municipal limits, ensuring streamlined tracking and patient management.
- The municipal website was regularly updated with COVID-19-related efforts, enhancing public awareness and transparency.
- The Mazi Health Mazya Hathi (MHMH) App was launched, allowing citizens to self-monitor their health and facilitating real-time data sharing with authorities.
- The second wave of COVID-19 was managed efficiently through pre-emptive strategies, resource mobilization, and digital interventions.
- Preparations for the third wave were initiated in advance, ensuring hospitals and healthcare systems were well-equipped to handle potential surges.

- Oxygen supply monitoring was effectively implemented, preventing shortages and improving crisis management capabilities.
- Vaccination drives were accelerated based on supply availability, with targeted initiatives such as "My Ward, 100% Vaccinated Ward" ensuring localized vaccine coverage.

**Statistical analysis demonstrated the effectiveness of Aurangabad's response**




Dated up to- 31 December 2022

- **Total Positivity Rate**
  - Aurangabad City: 8.11%Maharashtra State: 9.73%
- **Tests Conducted Per Million**
  - Aurangabad City: 930,848
  - Maharashtra State: 71,971
- **Recovery Rate**
  - Aurangabad City: 98.03%
  - Maharashtra State: 97.89%

## 13. Conclusion:

Aurangabad's COVID-19 response demonstrates a model for smart governance in crisis management. The city's use of digital surveillance, real-time data tracking, and innovative health initiatives enhanced decision-making, improved patient outcomes, and strengthened public trust. The successful implementation of digital historiography preserved valuable data, ensuring lessons from the pandemic remain accessible for future urban resilience planning.

The research underscores the importance of proactive governance, community engagement, and digital integration in managing public health emergencies. Aurangabad's case study offers insights for other urban centers aiming to enhance their pandemic preparedness and crisis response strategies. The findings advocate for continued investment in technology-driven healthcare solutions, robust data documentation, and transparent governance to ensure sustainable urban resilience in the face of future pandemics.

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