



Improving India's Pandemic Response through a Health Information System Reform

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ABSTRACT: Despite stringent lockdown measures to curb the spread of the 2019 Coronavirus disease (COVID-19), India remains vulnerable to an uncontrolled rise in the number of cases and deaths. Furthermore, in spite of the high number of recorded cases, the actual case counts may be much higher due to poor data reporting of probable and confirmed cases of COVID-19 from all of India's states. Being a populous country with the potential to become the world's COVID-19 epicenter, it should be the Indian government's top priority to strengthen India's health information system (HIS) to support their infectious disease response.

To ensure that this paper is guided by current research on India's HIS performance, a search strategy was developed on Ovid MEDLINE using database-specific subject headings and text words. The search terms used included: "health information systems" AND "India" AND "COVID-19" OR "Coronavirus."

Most district level COVID-19 information management is still paper-based, and with India's vast terrain, this approach is prone to data compilation errors. Furthermore, India's fragmented HIS has led to ineffective collaboration between COVID-19 response agencies at the central, state, and district levels, thereby creating barriers pertaining to the compilation and coordination of COVID-19 data.

Investing in the use of technology is a viable approach to strengthen the country's HIS performance during an infectious disease pandemic. To address the challenges associated with India's fragmented HIS, the government is encouraged to implement a national regulatory body to monitor health information inputs and outputs.

KEYWORDS: Health Information Systems, COVID-19, Infectious Disease, Pandemic, India

I. INTRODUCTION

On March 25, 2020, the world's most extensive national lockdown was implemented in India by the central government's Ministry of Health and Family Welfare (MoHFW). The lockdown aimed at controlling the spread of the 2019 Coronavirus disease (COVID-19) in the second-most populous country in the world [1]. Despite stringent lockdown measures to curb the spread of COVID-19, India remained vulnerable to an uncontrolled rise in the number of cases and deaths. As of March 10, 2021, there were approximately 11.3 million reported COVID-19 cases and 158,000 deaths in the country, the second-highest in the world after the United States [2].

Despite the high numbers of recorded COVID-19 cases, the actual case counts may be much higher due to poor data reporting of probable and confirmed cases across all of India's states. This is further exacerbated by the fact that each states' autonomous health system exposes the country to inconsistency in COVID-19 data management [3]. The subsequent underrepresentation of COVID-19 cases further reflects India's poor national response, leading to the misguidance of public health policies. As a populous country with the potential to become the world's COVID-19 epicenter, it should be the Indian government's top priority to strengthen India's health information system (HIS) to support their infectious disease response. Therefore, this paper will focus on highlighting strategies to consolidate India's HIS to effectively guide and manage the nation's response to infectious disease outbreaks.



II. METHODS AND SEARCH STRATEGY

To ensure that this paper is guided by current research on India’s HIS performance, a search strategy was developed on Ovid MEDLINE using database-specific subject headings and text words. The search terms used included: “health information systems” AND “India” AND “COVID-19” OR “Coronavirus.” Additional keywords were generated after inputs from the research team. The revised search strategy was customized for each of the following databases: PubMed, Ovid MEDLINE, Web of Science, and JSTOR. The PRISMA framework illustrates how the applicable journal articles were selected (See Figure 1).

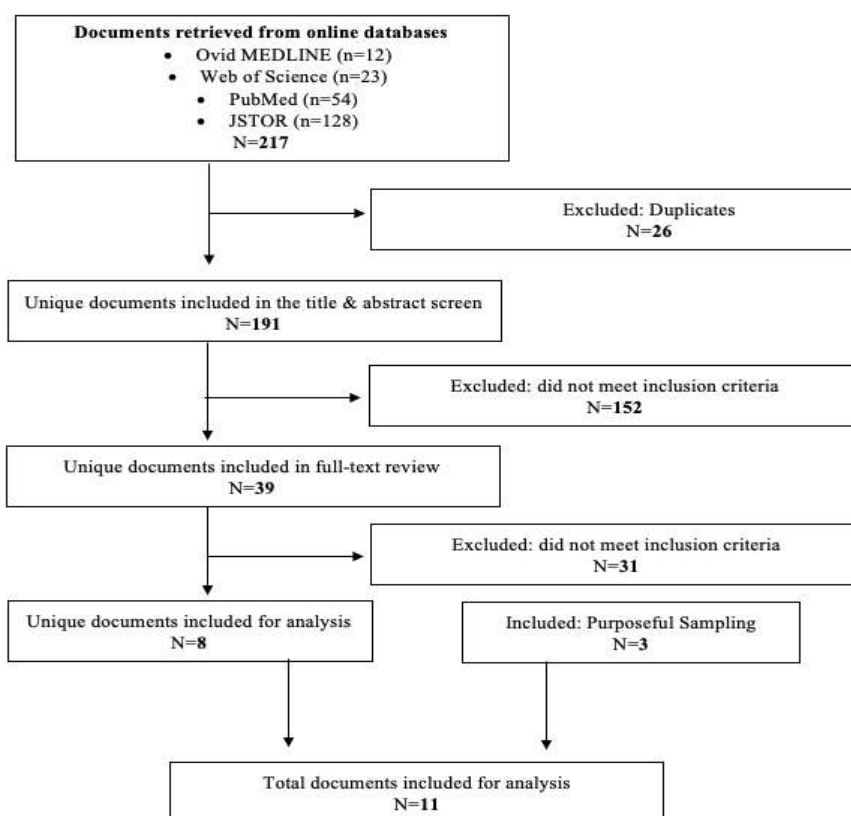


Figure 1: PRISMA Flow Diagram of Inclusion Process

III. DISCUSSION

The World Health Organization (WHO) categorizes the health system into six interrelated building blocks, including the HIS [4]. The HIS is responsible for collecting, compiling, and analyzing data across national and sub-national health sectors to inform health policy decisions [4]. As outlined by the WHO, the HIS enables decision-makers at all levels of the health system to identify factors affecting the health system’s performance, facilitate evidence-based policy-making decisions, and optimally guide the allocation of scarce resources [4]. In a pandemic scenario, the HIS is responsible for relaying actionable information to the central, state, and district sectors to ensure effective disease surveillance and control.

A. Performance of the COVID-19 Health Information Systems

There is increasing evidence that India’s COVID-19 data quality is significantly compromised [5]. This challenge undermines India’s capacity to provide sufficient evidence to guide their decision and policy-making process during their COVID-19 response [5]. Specifically, the poor data collection systems at the district level lack the applicable information technology (IT) to facilitate data transmission to a higher decision-making body. This shortfall negates their ability to understand COVID-19 transmission patterns across individual states. Although there is substantial evidence demonstrating the value of technology in information management, the use of technology in India’s HIS is only prominent in one state. Kerala is currently the only state to



have successfully launched an “eHealth” system to collect, store, and transfer electronic health records between different reporting levels [6]. Health data in most states are not yet digitized, making it difficult to standardize data management and transfer between government sectors [6]. Thus, while Kerala was the first Indian state to be affected by COVID-19, the state’s exemplary pandemic response, in comparison to other states, may be attributed to its strong electronic HIS [1]. Furthermore, most district-level COVID-19 information management is still paper-based, and with India’s vast terrain, this approach is prone to data compilation errors [6]. The subsequent data flow discrepancy impedes the availability of credible data on India’s COVID-19 burden. Evidently, there is a need for an improved data collection approach at all HIS levels to ensure that their pandemic response is driven by accurate, reliable, and applicable data.

B. Fragmented Health Information System across India’s Autonomous States

The lack of a centralized HIS reveals a significant gap in India’s COVID-19 data management across the country’s central, state, and district data reporting levels. Poor collaboration and disconnected linear communication between the three data reporting levels have significantly weakened India’s HIS performance. For instance, while death reports from some states contain suspected or probable deaths, most states fail to account for them, leading to underreporting of COVID-19 casualties [3]. Furthermore, it has been documented that 65% of total COVID-19 deaths in India are reported from only four of the nation’s 28 states [3]. Additionally, information regarding the incidence and prevalence of COVID-19 is only compiled at the state level, but is absent at the district level [5]. As such, the Indian HIS at the national level fails to account for the varying needs of populations across districts, which impedes the government’s ability to implement lockdowns that specifically target districts largely impacted by COVID-19. This reductionist approach to policy-making is partially responsible for India’s fragmented response to the current pandemic.

Furthermore, India’s disconnected HIS at the state level has also led to insufficient collaboration between COVID-19 response agencies at the central, state, and district levels, thereby creating barriers for the integration and coordination of COVID-19 data in the process. Consequently, it has become difficult to generate and disseminate information in a nationally standardized format that will benefit decision-makers at all levels. This poor coordination has also created an insufficient data feedback process from the central and state sector to the district level [5]. Without bidirectional constructive feedback, the district agencies will be challenged in their ability to guide their pandemic response.

Based on the current challenges affecting India’s HIS, this paper will outline specific policy-focused recommendations to improve India’s HIS performance during infectious disease outbreaks.

IV. POLICY RECOMMENDATIONS

The incorporation of technology within the HIS is a viable approach to strengthen India’s response during an infectious disease outbreak. To improve the country’s HIS, the government should take advantage of India being ranked first in the World Digital Competitiveness Ranking for telecommunications investment [7]. HIS policies need to focus on supporting states to adopt new technologies to build a coherent HIS that is responsive in making data available from all the states in real-time. The adoption of IT should be supported at the district level, as it will allow agencies to promptly generate actionable information that can be relayed to the states and subsequently to the federal coordinating agency while maintaining a feedback channel. Implementing a software system that will facilitate effective COVID-19 information management between districts, states, and the central level will address the poor data feedback process that currently exists. Incorporating such software in the HIS may also be useful in identifying disease patterns and improving infectious disease surveillance. Ultimately, these technologies will foster collaborative communication between the three levels of HIS and reduce data turnaround time during a pandemic.

To address the challenges associated with India’s fragmented HIS, the government is encouraged to implement a national regulatory body to monitor health information inputs and outputs. Currently, the government agency acting at the national level, the MoHFW, is responsible for implementing nationwide health initiatives and infectious disease control programs. However, MoHFW does not regulate the state agencies’ health decisions due to each states’ complete autonomy [8]. While states in countries such as Canada and China have control over their health systems, they are ultimately governed by national regulatory bodies to ensure consistency of the country’s HIS outputs [9,10]. These organizations were created in response to the severe acute respiratory syndrome (SARS) epidemic and successfully implemented a nationwide standardized HIS [9,11]. Therefore, adopting a hybrid of the regulatory systems developed by China’s Center for Disease Control and the Public Health Agency of Canada has the potential to improve India’s HIS coordination and performance. With the development of an infectious disease database, the regulatory body



can accurately compile reports of suspected contagious disease cases from the whole country to streamline interventions to affected communities for future infectious disease outbreaks. Overall, the implementation of a regulatory body in India would oversee infectious disease surveillance, knowledge translation of public health concerns, and regulation of public and private health hospitals.

V. CONCLUSION

The COVID-19 pandemic has highlighted the current weaknesses in India's HIS. This paper outlines recommendations aimed to regulate the HIS and ensure consistency in data collection and transmission throughout the country. By incorporating a national regulatory body and implementing IT, the proposed recommendations look to improve the Indian HIS to monitor and control for any future infectious disease outbreaks.

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