

Review Article

Contact tracing: a global perspective and recommendations for the Indian scenario

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Received: 28 June 2020

Accepted: 04 August 2020

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ABSTRACT

We are currently in the midst of a pandemic of SARS-COVID-19 that has spread and increased its reach geometrically in just 3 months. Different countries and states are employing multiple methods to decrease the spread of the virus and decrease its negative impact. The government of India also has taken steps to identify and trace all patients and their contacts. This requires immense input of manpower, finance and technological solutions. Models from India and all over the world act as guides in highlighting the advantages and pitfalls of this method. Models of South Korea, Taiwan and Singapore, where intensive contact tracing measures have been implemented have been successful in controlling the pandemic but have created issues of invasion of privacy. Most successful models, in the developing world have sought out to create a multi-disciplinary dedicated contact tracing team of roughly 2-3 contact tracers per 1000 population. It is important to set up a dedicated team for this so that the already stretched ASHA and other community health workers are not overburdened as more responsibilities might lead to decrease in quality. Such a team, which is sensitive to local customs and armed with basics of contact-tracing techniques, need not be highly educated. Technological solutions that keep user privacy as a priority and encourage transparent sharing of methodologies to ensure user privacy must be promoted. Solutions must ensure dissemination of information from trusted sources and self-monitoring of symptoms.

Keywords: Contact tracing, Indian scenario, Technology, AarogyaSetu, Review

INTRODUCTION

India, in the first week of May 2020, has over 26,000 recorded, active cases of COVID-19 infection.¹ The central government has started easing the lockdown it had imposed on the 10th of March 2020. However, that said, India prepares for a second wave of this novel infection². In the absence of a viable vaccine, a core public health intervention is contact tracing, which if undertaken at a massive scale may provide a viable midterm solution, until a vaccine is developed. Contact-tracing is done by identifying patients infected with the coronavirus (Infected) and quickly identifying and contacting all the people who may have come within 1 meter distance of the infected either 48-hours prior or 14-days after

development of symptoms in the infected³. These contacts are most likely to develop the disease and it is necessary to intervene among them by quarantine or hospital admission as early as possible. The process involves detective and investigative work to gather relevant data and history from the infected for the previous 14 days. The process is complicated by the fact that human memory is unreliable (on an average a human mind forgets about 70% of information in a day⁴) and that people are sometimes reluctant to share critical information for various reasons.^{5,6}

Many states, districts and communities in India have shown exemplary models of how contact-tracing needs to be executed but to scale up contact-tracing measures to

the entire country would require a large investment. Contact-tracing is extremely effective when done by people who belong to the community that they are working in. A firm grasp of regional and cultural knowledge has shown to be a massive factor when it comes to eliciting sensitive information from patients, who may be apprehensive of negative consequences of a positive diagnosis⁷.

In our article, we explore various models of contact-tracing performed in India and all over the world in search of an ideal method that may be implemented all over India, till such a time that we have a viable vaccine.

LESSONS FROM CONTACT-TRACING MODELS ALL OVER THE WORLD

There are many countries that have effectively used contact-tracing. South Korea provides an amazing example of innovations in contact tracing. After the MERS epidemic of 2014, the public health department of South Korea was well-prepared to handle a similar outbreak. In addition to conducting intensive in-depth interviews, they have collected patient data from Electronic Health Records, Cell Phone GPS trackers, Credit Card transactions, and CCTV footage⁸. Such an extensive analysis has led to massive reduction in active cases but has also given rise to concerns on privacy⁹.

Taiwan and Singapore, applied a technologically intensive approach, linking electronic medical records, insurance records and a toll free number along with an app TraceTogether which uses Bluetooth signals in cell phones to notify users if they had come in contact with the virus¹⁰, CovidWatch app developed by Stanford university works on the same technological principle.¹¹ Such technologically intensive approaches have been proven to be effective in small island states of Taiwan and Singapore. China used a color-coded model to categorize its population based on their chances of exposure to the virus. The Close contact detector app tells users upon scanning of a Quick Response (QR) code whether they are Green (free to move about in public spaces), Yellow (required to stay at home for a week) or Red (quarantined for two weeks). The administration has made it mandatory for people to carry this QR code and present it to authorities wherever required. By 21 February, in Zhejiang province itself a city of 50 million people more than 90% had downloaded the app and 98.6% were green.¹²

New Zealand has massively ramped up contact-tracing through telephonic conversations followed by text messages. In a situation where maintaining physical distance is key, this strategy has shown to be effective in the country. The contact tracing center traces over 700 contacts in a day¹³. However, New Zealand has only 1100 cases with less than 5 new cases being reported per day¹⁴. However, in a recent independent audit, the system has been shown to be massively overburdened¹⁵.

CONTACT-TRACING MODELS IN INDIA

Many local and state governments in India have tried to implement robust models of contact-tracing that would be best-suited for their region. These models offer great insight into the prerequisites of an effective contact-tracing campaign. In Bhilwara district of Rajasthan, a city with a population of 24 lakhs people,¹⁶ the epicenter of the disease was a hospital and the patient-zero was a physician. The administration put together nearly 2000 contact-tracing teams¹⁷. Their model incorporated ASHA workers, village elders and sarpanch's and other grassroots health workers and they were able to screen approximately 92% of the population within 9 days.¹⁸ Owing to this success, Bhilwara currently has only 7 active cases today while it had around 40 cases in the beginning of April.¹⁹

Anticipating the pandemic, the Himachal Pradesh government launched the Corona Mukht Himachal App (phone application) for its residents. This app tracked the location of the user using GPS technology and the user if found to violate home quarantine rules was quarantined in a designated facility²⁰. The government also made efficient use of the government hierarchical system that was already in place. It assigned block officers, gram panchayat office-bearers and district magistrates as nodal officers, who were responsible for their area of jurisdiction. A total of 16,000 employees screened the entire population of 68 lakhs. The government paid special attention to its residents stranded outside the state borders. Every single returnee was registered and followed up to check for signs or symptoms of the disease^{21,22}. There has been no new reported case from Himachal Pradesh since 23 April.^{23,24}

Kerala, a state armed with precious knowledge gained during the Nipah Outbreak of 2018 was one of the first states to swiftly respond to the pandemic²⁵. Like the Nipah Virus outbreak, state authorities enforced strict contact tracing measures even before the pandemic spread to a large extent²⁵. However, the patient load of the Nipah Virus was small as compared to COVID-19, with only 19 cases and 1400 contacts²⁵. Various districts in Kerala implemented novel models to elicit and categorize relevant history. The district of Pathanamthitta set up a flowchart model- firstly, to track a family returning from Italy who had skipped screening at the airport. Later, the system was extrapolated to the entire state and to the neighboring state of Karnataka²⁶. State authorities also made extensive use of route maps to chart paths traversed by suspected cases or their contacts^{27,28}. Over 92% of COVID-19 patients have recovered in Kerala with only 34 active cases present today as compared to 266 on 6 April, 2020.²⁹

Many other districts such as Bangalore, Pune, Agra³⁰⁻³² etc. with an enormous case load of COVID-19 have set up war rooms, where departments such as, healthcare department, police department and the Collectorate

collaborate, investigate and ultimately triangulate the location of suspect and immediately trace all of its contacts³³.

The National Capital of Delhi which has seen a huge caseload of COVID-19 (3123 active on 4 May) has been unable to carry out contact tracing effectively. Their efforts have been further undermined by the reluctance of international travelers to self-identify and the Tablighi Jamaat religious congregation. Contact tracing of all such travelers and people who attended the congregation took additional 4-5 days which contributed to the increase in caseload.³⁴

In Punjab, the lack of contact tracing was exemplified by the case of an individual who had travelled across 3 districts and had contacts in the thousands but only 500 of them could be traced. Government officials also showed an improper understanding of viral transmission, assuming that asymptomatic individuals could not spread the disease. The disease was mostly spread in the state by people coming from foreign countries who had landed in Indira Gandhi International Airport. The database on these travelers reached the state headquarters after a delay of 4-5 days by which time the harm had been done.³⁵ Uttar Pradesh, a state which has over 2645 confirmed cases also failed to track international travelers. In addition, it also failed to track domestic travelers who worked as migrant labourers in the states of Gujarat and Maharashtra.³⁵

Mumbai, the city worst hit with the COVID-19 pandemic has been unable to contact trace effectively due to the high population density of the “chawls”. A person living in the chawls comes in contact with at least 80 people a day but hardly 10 of them are being traced. The people belonging to the lower socio-economic background, because of a lack of awareness and poor understanding are unable to follow social distancing guidelines.³⁶⁻³⁸

WORKFORCE NEEDS

Looking at examples of what has worked where, Himachal Pradesh employed 16,000³⁹ people to support the contact tracing efforts for 68 lakh people, whereas Bhilwara had over 2000 teams comprising of a total of around 10,000 officials¹⁷. When averaged out for the population it comes out to be 2.35 contact tracers per 1000 population and 4.1 per 1000, respectively. Looking at models from all over the world, Massachusetts would have 0.15 contact tracers per 1000 population⁴⁰, 0.04 in New Zealand¹³, 0.07 for Iceland⁴¹ and 0.81 for the City of Wuhan, China⁴². As is evident by the numbers, regions in India clearly seem to have a large number of people involved in contact tracing however it is important to note that contact tracers in India, namely ASHA workers, village panchayats also have other roles to perform and might not be as efficient as dedicated contact tracing teams.

The difference in numbers would mean that implementing a Bhilwara like model all over the country would mean deploying 5.3 Lakh people and that of Himachal would mean over 3 lakh people. Currently, India has about 9 lakh ASHAs⁴³, 283597 gram panchayat officers, 7091 block development officers, 6856 Sub district magistrates and 734 District Magistrates. The already existing workforce that could be deployed for contact tracing is close to 12 lakh people. However, it must be clearly noted that all the above-mentioned employees and ASHA workers have other duties they must perform. Overburdening them with an additional task of contact tracing could result in low quality contact tracing and potentially another outbreak. Hence it is imperative for the states and districts to understand the caseload of COVID-19 and efficiently assign roles, even hiring a dedicated contact tracing workforce if need be.

According to our calculations an average of 2-3 per 1000 population strong dedicated contact tracing workforce would be needed for India. This number is similar to the Himachal Model (2.35) and 3 times higher than the Wuhan, China Model (0.81). This number is also similar to the number of ASHA workers required by the National Health Mission (1 per 1000)⁴⁴. Making a contact tracing workforce of over 3, 00,000 officers all over the country, fluent in local traditions and customs and moderately educated would be an enormous task for the administration.

TECHNOLOGICAL NEEDS

With the help of technology, the capacity of the contact tracing workforce could multiply. A single contact tracer, armed with appropriate technologies either in the form of mobile app or software could potentially track multiple suspected cases/contacts, simultaneously. Technological solutions would be needed to trace movements of suspected contacts, to alert users whether they have come in contact with a suspected carrier, to facilitate self-monitoring at home.

To trace movements of suspects, 3 main technologies are used; GPS signaling, cell phone tower triangulation and Bluetooth signaling. The former two although more accurate are extremely difficult to anonymize and put user privacy into jeopardy⁴⁵. The latter one is criticized because cell phone users do not usually keep the Bluetooth mode on their device active. South Korea developed an app called Corona 100m app that used GPS signaling to locate suspects⁴⁶, whereas India, Taiwan and Stanford University have developed apps ArogyaSetu, TraceTogether and CovidWatch¹¹ respectively that work on the Bluetooth signaling technology.

In New Delhi, a small team has developed an app WashKaro that enables the user to self-monitor symptoms; this feature of the app could help contact tracing officials monitor suspects on a daily basis remotely. Further technological solutions would be

required to formulate and disseminate teaching material required to train the newly appointed workforce. Technological solutions that put user privacy as priority and participate in transparent sharing of methodology used to ensure patient privacy must be encouraged without compromise.

SETTING UP A DEDICATED CONTACT TRACING WORKFORCE

Why do we need a dedicated contact tracing workforce? Health workers in India from ASHA to the Medical officer have multiple duties and responsibilities to fulfill. Assigning them additional contact tracing duties could mean a decrease in their abilities to perform Home Based Post Natal New Born care, accompanying mothers for delivery, immunization and motivating couples to use contraception. Such a decrease in standards would be extremely harmful to the society. Many healthcare officials are in any case overburdened and additional duties would result in a decrease in quality.^{47,48}

Deploying such a massive task force all over the country could create problems of quality assurance and could be a logistical nightmare. This daunting task is made somewhat easy by the fact that contact tracers need not be highly educated, a simple high school education should suffice. The capability of this task force to work remotely from home also eliminates the need for heavy investment into establishing novel infrastructures and availability of a smart phone and internet connection should suffice. However, for contact tracers working in the field, provisions of PPE and other necessary equipment would need to be provided.

Contact-tracers need to be trained in basics of disease transmission, concepts of quarantine and isolation, basics of asking relevant history in a culturally appropriate manner and importance of data collection and maintenance of privacy. Online training modules should enable the administration to educate this workforce; however the importance of translation of these teaching modules into regional languages should not go unrecognized.

The role of the central government in running this task force should be formulating clear and transparent rules and strictly enforcing them. The center should create basic training modules and standard operational guidelines that may be modified according to local customs without losing effectiveness. It must empower states and local governments to decide what is best for their regions and respect their autonomy. Moving down the tier, individual states should undertake the responsibility of judiciously assigning resources based on the number of patients in specific regions and retaining the flexibility to rapidly respond to new outbreaks in other areas. The district administration would need to carry through a major chunk of the contact tracing efforts. At this level maximum coordination between different

departments within a contact tracing task force would be needed and expected to be able to respond to emergency situations rapidly and effectively.

CONCLUSION

Transitioning from population-based mitigation measures into case-based interventions is a necessary next step in the management of the coronavirus pandemic. Contact tracing must be at the core of any such strategy. Models from all around the world and especially India have shown how to ideally perform such a mammoth task. Examples from regions that have been unable to perform contact tracing have highlighted its importance and shed light on the obstacles that could arise. We recommend that the government would need at least a dedicated contact tracers of around 2-3 per 1000 population until a vaccine is developed. Such a workforce would need to be trained and sensitized to the process of contact tracing. An injection of manpower and finances is necessary at this critical juncture. The use of transparent technological solutions which keep user privacy as a priority should be encouraged. The local government must take it under their umbrella this responsibility and must be aided at every step with resources and insight by the state and national authorities. The art of contact tracing is of vital importance to the state, to put it mildly, a road to safety or ruin. Hence it is a subject of enquiry which on no account can be neglected.

Funding: No funding sources

Conflict of interest: None declared

Ethical approval: Not required

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Cite this article as: Puntambekar V, Sharma P, Mulchandani M. Contact tracing-a global perspective and recommendations for the Indian scenario. *Int J Community Med Public Health* 2020;7:3740-5.