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*Dr. Sandeep G. Kudtarkar*

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# Dharavi Model: A Framework for Containing Covid-19 Pandemic in Resource-Limited Democratic Settings

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## ABSTRACT

*Dharavi, an urban slum in Mumbai, infamous as the biggest urban slum in Asia, came into limelight in 2008 when British film "Slumdog Millionaire" narrated the story of 18-year-old Jamal Malik from Dharavi slums of Mumbai, portraying neglect and abuse of the urban slum dwellers and their surviving challenges, won eight Academy Awards including the Best Movie award, driving attention to a space that was always overlooked.*

*The same Dharavi emerged in 2020 as the prototype for the policymakers and public health practitioners in emerging economies like Brazil, South Africa, and Philippines for containing the spread of Covid-19 in densely packed urban slum communities in resource-limited democratic settings with its "Dharavi Model" of dogged & innovative approach of "Chase the virus".*

**Keywords:** pandemic, resource constraints, community participation, leadership, healthcare infrastructure

## I. INTRODUCTION

The first official COVID-19 patient was reported in Wuhan city in China, in 25th December 2019 (WHO). The World Health Organization announced the epidemic of Covid-19 as pandemic on March 11, 2020 and suggested a series of preventive measures to contain the spread of corona transmission across the globe. Soon the pandemic spread like a forest fire. In mid-July, more than 1 million cases were reported globally in just four days, indicating its threatening accelerating spread. The COVID-19 pandemic

evoked ostentatious global disruption setting immense burdens on global healthcare systems.

The government and the policymakers worldwide endeavored to manage this historic medical event and finding ways and means to stop the transmission of virus and flatten the curve, especially in the limited resource settings. The pandemic battered the world economy, which IMF announced as a "severe recession" in the global economy. More than one billion residents living in slums in cities across the world emerged as hotspots for COVID-19 transmission due to the scarcity of basic hygiene amenities like water, toilets, sewers, and waste management.

In India, which eventually became the third country behind the United States and Brazil in terms of confirmed coronavirus cases, the first corona patient was reported on 27th January 2020 in Kerala (Ministry of health in India mohfw.gov.in). The Indian government declared the countrywide lockdown on 25th March 2020 for containing the transmission of infection. But the stringent lockdown imposed a hard measure for the socio-economically poorer sections of the society, forcing millions of the slum's daily-wage residents on the verge of indigence.

The first corona patient in Maharashtra, was reported on 29th January 2020 (mohfw.gov.in), while Mumbai, the capital of Maharashtra and financial capital of India reported first patient on 10th March 2020. The lockdown imposed in Mumbai on 21<sup>st</sup> march was one of the largest in terms of people, with a population of more than 15 million in a limited geographical area of 440 sq. km, one of the most densely populated cities on earth, among all the major global cities combating war against Covid-19 pandemic. Dharavi, an

urban slum in Mumbai, had reported its first patient on first April and very soon turned into a corona hotspot with hospitals overwhelmed. All ICUs occupied, and it was anticipated that people in the slums would be hardest hit by Covid-19. But things turned out differently.

## II. LITERATURE REVIEW

A fundamental property of communicable diseases epidemic is that early infected people keep infecting susceptible people very fast and ends when the number of immune people develops herd immunity unique for such disease. The infectious disease epidemiologists use mathematical modeling to understand and estimate how diseases will spread in populations. One way to attain the herd immunity is through vaccination. (Ashleigh et al. 2020)

An integrated societal approach to pandemic preparedness requires the participation by all sections of society like NGOs, local community, and spirited individuals along with the health sector at the front to combat the pandemic. Business continuity and contingency plan involving critical activities such as capacity building, planning, organizing, coordination, and communication across all the levels and involvement of all stakeholders is required (WHO 2009).

Research by the Humanitarian Policy Group (HPG) and Humanitarian Practice Network (HPN) studied measures to contain the outbreak of the Ebola epidemic in the African continent in 2014, suggesting to engage local communities to contain the spread of virus supported by humanitarian touch by building on existing social structures of leadership and PPP modality to build national emergency response capacity (Sorcha O'Callaghan 2020).

After the outbreak of pandemic, till the development of the vaccine, various individual level measures like hand disinfection with alcohol, gargling, ventilation, balanced diet, regular exercise, plenty of rest, mask-wearing, and social and political measures like social distancing, work for home, and lock downs were imposed

worldwide to contain the pandemic. The preventive actions such as social distancing measures depend upon the voluntary efforts of individuals, social groups, and organizations (Nomura et al. 2020).

The urban slums are ill prepared for the pandemic of an infectious disease due to scarcity of basic human needs such as water, toilets, sewage drainage system, waste management and safe housing. Moreover, the living space contraction, unrest, and overcrowding in urban slums make physical distancing and home-quarantine impossible to manage, lead to the rapid spread of infection. The poor population becomes economically vulnerable due to stringent pandemic measures like lockdown. Any strategy to contain pandemics that does not recognize these realities jeopardize the survival of large segments of the financially distressed urban population globally (Corburn j.et.al.2020).

The previous pandemics such as HIV, Ebola rendered the hard learned lessons to the policymakers, public administrators, NGOs, and communities worldwide to innovate beyond disaster response and move toward long-term plans (Golechha M. 2020). In the recent past, the 2014 Ebola outbreak has made clear the fragility of existing health systems. The measures of responding to the ongoing epidemic shall furnish the further lessons of preventing the next global medical catastrophe by forging partnerships across borders and disciplines and demonstrating commitment to value all human lives. (Online-learning.harvard.edu 2020)

## III. "THE DHARAVI MODEL."

Dharavi, the urban slum in Mumbai, the economic capital of India, has gained an odious honor as Asia's largest slum made up of small packets of Muslim Nagar, Matunga Labour Camp, Indira Nagar, Laxmi Chawl, Janata Society, and Social Nagar, spread over three sq. km with a population of 0.3 million per sq. km. is densely populated urban slum where large numbers of migrant workers live and work in small spaces accommodating nine to ten family members. The urban slum is populated with single or multi-story houses located in narrow lanes. The area has

5,000 GST tax registered enterprises, 15000 single-room factories and is a hub of international exports with an annual turnover of 1 billion USD. The century-old pottery businesses in Dharavi provide bread butter for more than five a thousand families.

With the upsurge of COVID-19 in Dharavi on the first day of April, everyone in the city angst that the corona shall transmit like a forest fire and shall turn Dharavi’s narrow, congested lanes into a graveyard as social distancing or contact tracing was impossible considering its geographical constraints, health disparities, and social and economic inequalities. After the COVID-19 outbreak, the virus started swiftly spreading in the community. The number of new coronavirus cases increased exponentially, peaking at 565 infections in a span of just one month with a 15% growth rate and a case doubling period of 18 days. But in just two months, the thickly populated Dharavi slum miraculously flattened the COVID-19 infection curve with its innovative “Dharavi Model” of **“chasing the virus”** then waiting for people to report it.

#### IV. CHALLENGES OF DHARAVI MODEL

##### 4.1 Social Distancing

About 10-12 people live in small tenements with an area of three by three meters existing along both sides of narrow lanes with most of the houses with two and three floors where the ground floor is used for living and upper storeys used as small factories as Dharavi is a home to varied small-scale leather, pottery, and textile manufacturing units. Such a congested urban slums imposed severe limitations on conventional solutions during a pandemic such as social

distancing and contact tracing with no possibility of effective “home quarantine”, making it impossible to control the spread of infection and community transmission, posing deadly challenge of containing epidemics like corona.

##### 4.2 Economic challenge

The stringent lockdown snatched away livelihoods of a larger section of residents of Dharavi overnight, maximizing economic loss of the slum population of daily wage earners and migrant laborers with no saving even to run their livelihood for a week, forcing them to step out to earn something to keep their families alive amid the surrounding terror of pandemic.

##### 4.3 Hygiene problem

Ninety cents Dharavi population uses soiled & cramped community toilets shared by thousands heightening fears of the spread of diseases. A dirty, crumbling lavatory on the main road of Dharavi was used by 5,000 people living in the nearby buildings. The population lives in shanties and dilapidated habitations with narrow lanes, open sewers, waste heaps and lack of sanitation - a perfect recipe for the spread of corona.

##### 4.4 Lack of a trust for civic body workers & challenge of communication

As the residents had a trust deficit towards the civic body Bombay Municipal Corporation (BMC) workers, it was a great challenge to convince them to move to quarantine centers from their homes after detecting the virus symptoms. Establishing the communication with a residents in Dharavi was a great challenge for authorities.

#### V. DHARAVI MODEL - STRATEGY, GOVERNANCE & ACTION PLANS

Dharavi Model of Corona Containment					
Leadership, Governance & Strategy					
State Government Leadership & Pivotal Role by Mumbai Civic Body BMC					
Strict Enforcement of Lockdown	Four T strategy of "Chase the Virus	Resource Mobilisation	Quarantine and Isolation facility	Supply of food during lockdown	Communication

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Community Partnership & Ownership		
Participation by Private sector, NGOs and Philanthropist	Commitment of Health and Essential services workers	Discipline shown by the local population

*Source: authors' Creation*

### 5.1 Government Leadership

The state government acted swiftly and coordinated effectively from the headquarter. A team of doctors and technical experts was sent to Dharavi and monitored by the apex state leadership of the Chief Minister, the Health Minister, senior government officers, and top officials of Bombay Municipal Corporation (BMC), the civic body of Mumbai city. They explored various steps and response strategies at war footing.

Strategically, Dharavi was prioritized over other parts of Mumbai city, and 2500 government health workers were engaged for it alone. The Dharavi Covid-19 containment strategy and the operational plan were prepared as per WHO and the Indian Council of Medical Research (ICMR) to combat the pandemic. The administration also referred the Kerala model of COVID-19 prevention to formulate its strategy.

### 5.2 Four "T" Strategy - Testing, Screening & Medical measures

BMC adopted "Four T" (tracing, tracking, testing, and treating) strategy to tackle the virus. BMC changed its traditional approach of waiting for reporting by patients and adopted a strategy of proactive screening named "Chase the virus" as part "Mission Dharavi" with the assistance of the local private doctors and local community support for early detection, timely treatment, and recovery.

Under the "Mission Dharavi", nearly 0.5 million people were screened, more than 14000 individuals were tested, and 13,000 suspects were moved to institutional quarantine equipped with medical facilities and a community kitchen for free. The medical workers set up a "fever camp" in a different part of the slum to screen residents for

symptoms of Covid-19. More than 10,000 senior citizens vulnerable to the infection were surveyed with special care. The public toilets were sanitized and disinfected several times a day by the civic administration to address hygiene challenges. The people in slum using community toilets with a high risk of contamination were shifted to quarantine facilities. All patients with symptoms for three successive days were tested and sent to hospitals, while asymptomatic patients were shifted to institutional quarantine centers for 14 days.

### 5.3 Private Participation

The local private doctors came forward willingly and BMC equipped them with PPE kits, thermal scanners, pulse oximeters, masks, and gloves and, with their assistance, started door-to-door screening in high-risk zones to identify the suspects. The BMC distributed 20,000 food packets daily with the help of its staff, police, and social workers as many residents of Dharavi were hand-to-mouth earners. These food packets were sponsored by NGOs, charity trusts, and some corporates, and handed over to BMC for distribution.

### 5.4 Resource Mobilisation

The local Schools, wedding halls and sports complexes were repurposed as quarantine facilities where free meals, vitamins, treatment facilities and "laughter yoga" sessions were provided. The Mobile vans were used for screening and testing. The basic epidemic control training was imparted to grass-root level health workers and personal protective equipment (PPE) was availed to all health workers involved in screening testing and treatment. The BMC built a 200-bed hospital with oxygen beds on a vacant slot. The BMC started a toll-free helpline (1800221292) and set up a control room at its



headquarters of the G/North ward of Mumbai for supplying food, shelter, and transport during the lockdown.

The BMC administration, in proactive collaboration with social workers and philanthropists, arranged PPE kits, oxygen cylinders, hand gloves, face masks, medicines, and ventilators for on-duty health workers. The thermal scanners were used to measure the body temperature and oximeters to measure oxygen levels for tracing people with depleted oxygen levels. Those identified with symptoms were further taken for lab testing. The BMC supplied a seven-day stock of PPE kits to all local doctors and helped them to open clinics. With the help of these doctors, fever clinics and medical camps were organized to screen high-risk and vulnerable populations.

### *5.5 Strict Enforcement of Lockdown*

The government deployed State Reserve Police Force (SRPF) in Dharavi to assist the Mumbai Police equipped with drones to enforce strict lockdown in virus hotspots housing 1,25,000 people. A strict lockdown was enforced in the Dharavi and only critical patients were allowed to shift in nearby hospitals. The people's movement was monitored by the drones deployed in locality. The borders of containment areas were sealed using barricades to restrict people's movement. All shops, small factories, and the market area in Dharavi were closed, and all sorts of transport services were restricted.

To lessen the discomfort to the public due to stringent lockdown, the administration supplied essential commodities like milk, vegetables, groceries, and other essentials door to door and other local demands were taken care of by setting a control room coordinating various departments

### *5.6 Participation by NGOs & Local Community*

BMC roped in 350 local private doctors who were insiders and trustworthy for the local population. In the multi-sectorial approach, the doctors, social workers, local community leaders, non-governmental organizations (NGOs), individuals, families, and communities worked together

wholeheartedly to battle the war against the pandemic. The volunteers distributed rations to needy people to ensure they didn't go hungry. The grocery kits and food packets were distributed in hotspots to prevent the movement of people. The local community leaders were appointed as "Covid warriors" to address the concerns of locals.

### *5.7 Pivotal role by BMC*

The BMC administration collaborated with other line departments for various containment activities like door-door-screening, risk communication, and supply of essential groceries to ensure the effectiveness of lockdown. The officials focused on five high-risk zones with initial infections and patients. Twenty-four hour working control room was set for monitoring the entire process of tracing, testing, quarantine, and lockdown in the containment zones. The entire slum was divided into clusters and zones and assigned to workgroups to swiftly conduct the testing, tracing and treating the patients. These workgroups conducted screening of almost 50,000 people through door-to-door screening and at municipal dispensaries. Several fever clinics were started for screening and testing for symptoms of the virus.

### *5.8 Quarantine & Isolation facilities*

The home quarantine was not possible due to crowded settlements; hence institutional quarantine facilities were ramped up to arrest the spread of transmission. Since all 90% population were using community toilets, BMC worked out a well-articulated sanitation and disinfection campaign in the entire slum area giving special attention to sanitization of the public toilets. The BMC workers cleaned and sanitize every nook and corner of Dharavi for preventing the community transmission.

BMC converted schools, marriage halls, and community centers into quarantine centers equipped with food, regular checkups, free healthcare, and testing. BMC converted a local Rajiv Gandhi Sports Complex into a quarantine center of 300 beds. Almost 10,000 people were sent to these centers for quarantine. BMC also took possession of five local private hospitals and

their staff, and medical equipment to treat COVID-19 positive patients. The administration organized yoga, aerobics, laughing and breathing exercise sessions for boosting immunity and releasing mental stress of quarantined people.

The state and district rapid response teams (RRTs) trained the health workers to enhance their skills of clinical treatment and healthcare management. In a short span of ten days, more than 50,000 people were screened, symptomatic people were tested for the virus and those detected positive were sent to medical facilities for treatment. Those with co-morbidities and close contact with positive patients were also shifted to institutional quarantine centers. The health-care camps were arranged to facilitate free virus testing. Many private clinics in the area to remain open for a longer duration to enable more testing and positive patient detection.

### *5.9 Exemplary commitment of health and essential services workers*

The private doctors wearing personal protective equipment in the sweltering heat, with no food or water for more than four to five hours at a time after wearing PPE kits, volunteered to find and treat coronavirus cases and also worked in their clinic treating patients with symptoms of virus infection and shared the details of suspected cases with BMC for follow-up action.

Many positive cases were identified through such private clinics. A team of 150 doctors from the Maharashtra Medical Association helped BMC workers in the process. Four constables from Shahu Nagar police station, with jurisdiction over a large part of Dharavi, were tested Covid-19 positive. During span of one year, more than 150 essentials services workers of BEST (local traveling service), BMC, Policemen and railway employees sacrificed their lives in a war against covid-19 in Mumbai city.

### *5.10 Dealing with Economic hardship of residents*

Initially, the gap between government's relief efforts and resident's needs was huge. Bridging it solely by the administration was difficult. But NGOs like Acorn Foundation came forward,

distributing ration and food to thousands of households in Dharavi during the stringent lockdown.

### *5.11 The extraordinary Discipline exhibited by the people of Dharavi*

The residents of Dharavi strictly followed all lockdown rules. They did not leave the home even though it was difficult for them to stay at home due to small size homes. Although not much literate, people in the area were aware of the consequences of moving out of home. The drone images taken over Dharavi showed that all streets in Dharavi were empty; no one was walking around, unlike some other areas in Mumbai where people were moving out of their homes despite the warnings. Many residents & local leaders in Dharavi took over the charge of securing their own area.

## VI. DISCUSSION - THE OUTCOME OF THE DHARAVI MODEL

### *6.1 Intensity of Spread of virus in Dharavi*

In late March, Dadar, the well-off nearest area of Dharavi, was overwhelmed with positive cases. The early cases in Mumbai spread due to foreign travelers from US and other foreign countries. The number of covid-19 cases began to appear in Dharavi only in April when there were already 300 plus positive cases in the state of Maharashtra, out of which 200 from Mumbai city. Dharavi situated at the heart of Mumbai had reported the first coronavirus case on April 1, a week after the national lockdown was announced. In next 43 days, Dharavi became a hotspot of coronavirus, recorded more than 1000 cases and 42 deaths exhibiting the extent and intensity with which the virus spread in Dharavi.

On 13th May, 2020, Dharavi's positive patients tally surpassed the 1,000 mark which increased further to 2000 by ten June 2020. The cases reached 1500-mark in just next 10 days and 2000 mark in next 9 days. Dharavi had 491 cases in April 2020 with a 12% growth rate and a case doubling period of 18 days. In one building called as "chawl" in this area, seven people living in



three adjacent houses of a chawl died four days showing the deadly spread of the virus.

### 6.2 Start of the "Mission Dharavi"

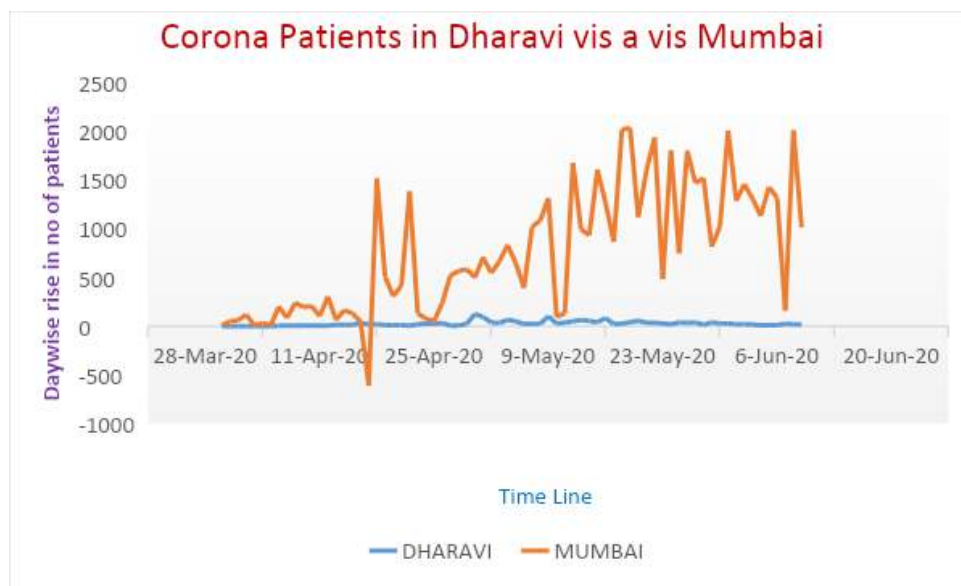
Understanding the severity of the problem, Mr. Kiran Dighavkar, assistant commissioner of Dadar ward in south Mumbai, BMC's administrative unit covering Dharavi launched the Dharavi Mission on April 18, 2020 the day after Dharavi reported its first 100 cases.

### 6.3 Outcome of "Mission Dharavi"

Dharavi did not report a single death from a coronavirus pandemic in the first week of June and showed daily increases in cases in the single digits from mid-June onwards while numbers were rising exponentially in Mumbai's posh high-rise localities (figure1).The number of

average cases came down to 27 in June from the average of 48 cases in May 2020. The doubling rate was improved to 44 days in June from 18 days in May and further to 240 days on 26<sup>th</sup> July when only two COVID-19 cases were reported in the entire day. But months later, the number rose again, until 25<sup>th</sup> December 2020 when zero COVID-19 was reported.

The proactive measures adopted under Mission Dharavi enabled the decline of corona transmission growth rate to 4.5% in May 2020 and further to 1% by 15th June. The doubling rate of COVID-19 cases in Dharavi declined from 18 days in April to 43 days in May and further to 108 and 430 days in June and July, respectively. These numbers were contrary to other parts in India, where Covid-19 patients were tripled in May 2020. (figure2)



Source: Times of India, Author's Calculation

Figure 1: Corona Patients in Dharavi vis a vis Mumbai

### Reported cases appear to decline in Dharavi while rising in India overall

New daily covid-19 cases per 100,000 residents in Dharavi compared to India as a whole



Note: Dharavi population estimated at 1 million residents.

Sources: Population estimates from the World Bank and the World Economic Forum. Case counts from Johns Hopkins University and Municipal Corporation of Greater Mumbai.

THE WASHINGTON POST

Source: *The Washington Post*

Figure 2 : Reported cases declining in Dharavi while rising in India

## VII. GLOBAL APPRECIATION FOR DHARAVI MODEL

Dharavi Model's success of flattening the corona transmission in extremely crowded zone and turnover from corona hotspot to almost corona-free zone received appreciation from all over the world. The World Health Organisation (WHO) had applauded Dharavi for its fight against coronavirus. The WHO Director-General Mr. Tedros Ghebreyesus, during a virtual press conference in Geneva, mentioned the successful example of Dharavi - a densely populated area in the megacity in containing the spread of the virus. The World Bank appreciated the Dharavi model of corona containment in its Poverty and Prosperity report.

The Philippines government decided to follow the Dharavi model to stop the virus from spreading in its congested cities and contacted BMC, which shared the Dharavi blueprint with the Philippines authorities for its implementation in Philipines. The Indian central government suggested other Indian states to replicate the Dharavi model of "chasing the virus."

The "Dharavi model" and the vaccination drive have helped in successfully containing the second wave in Dharavi in 2021, proving the efficacy of the model.

## VIII. SUGGESTIONS

### 8.1 Public-Private Collaboration

The Dharavi model highlighted the significance of cooperation between the public and private sectors partnership (PPP) for dealing with a medical emergencies and managing the tremendous burden on the existing healthcare infrastructure. The local government administration should formulate PPPs with the local civic groups, and local doctors for testing, screening, tracing, treatment and controlling the epidemic while taking care of a poorer section of the society by arranging food and other necessities during stringent lockdown times.

### 8.2 Local participation

The local private doctors social workers fetching respect from the local population can be utilized as a bridge between local administration and residents to create an environment of trust for the local population to come out and report symptoms and convince them to relocate to institutional quarantine for their benefit.

### 8.3 Community Participation and Ownership

Community Participation and ownership with community-driven humanistic approaches is crucial to contain the transmission of the virus as the local leaders can understand and solve the

problems of residents. Community involvement and participation & collective solidarity can help authorities to contain the pandemic with appropriate measures with a humanistic touch.

#### *8.4 Ensuring an uninterrupted supply of essential food items and groceries.*

The community kitchens can be built with the help of NGOs and philanthropists to provide food to poor daily wage earners housed in the quarantine centers to ensure uninterrupted supply of essential food items and groceries for people in containment areas to increase their resilience during such medical crises.

#### *8.5 Agile and accurate data and risk communication*

A fast, clear, and accurate communication is required to handle the pandemic. The administration should provide the right information using tools like toll-free helpline numbers and social media in the right way and timely manner to enable appropriate measures to protect the affected people. The population can be provided correct scientific information and guidelines to deal with the crisis in their local language.

#### *8.6 Efficient and effective governance*

Proactive Leadership with innovative thinking, multi-pronged approaches, Customized solutions, micro-mapping, robust surveillance, efficient and effective governance is an essential component of a well-planned pandemic control strategy and action plan. The leaders should build trust to harness people's involvement and support for ruthless containment measures like lockdown in extremely crowded localities with the poorest socioeconomic conditions and with negligible health infrastructure and scarcity of space for social distancing in the absence of effective medical tools like a vaccine.

#### *8.7 Lessons for future*

This pandemic is an opportunity for policymakers worldwide, especially in emerging economies, to make cities more all-encompassing, and resilient.

The governments must strive to improve the quality of basic amenities in the urban slums in the crowded cities to improve the quality of life of its residents and improving the current public health care infrastructure and improve share of the spend on healthcare out of its GDP while working to achieve the millennium goals of education, public health, safety, and economic prosperity unto the last.

## IX. CONCLUSION

The movie "Slumdog Millennium" ends with a Bollywood-style musical number, "Jai Ho" .which can be roughly translated as "May there be victory". The Dharavi model which successfully flattened the curve in 60 days with its strategy of four T's—tracing, tracking, testing, and treating to contain COVID-19 response manifest as the symbol of human victory in the war against Covid-19 pandemic and emerged as a global model for the policymakers and public health practitioner globally for breaking the chain of transmission and flattening the curve in settings where maintaining social distancing is not possible to follow across the world in the eternal war between the nature and humanity.

#### *Declaration*

The article is compliant with all ethical standards. There is no conflict of interest.

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