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at

IQVIA

Assessment of India & South Korea – Capacities in response to COVID-19

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PG/18/085

Under the guidance of

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June 19, 2020

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This certificate is issued in recognition of successful completion of 4 months of **her Project** in the department of **Public Health.**

We wish her all the best for future endeavors.

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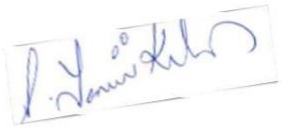

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The Candidate has successfully carried out the study designated to her during internship training and her approach to the study has been sincere, scientific and analytical.

The Internship is in fulfillment of the course requirements.

I wish her all success in all her future endeavors.

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Certificate of Approval

The following dissertation titled **"Assessment of India & South Korea – Capacities in response to COVID-19"** at **"IQVIA"** is hereby approved as a certified study in management carried out and presented in a manner satisfactorily to warrant its acceptance as a prerequisite for the award of **Post Graduate Diploma in Health and Hospital Management** for which it has been submitted. It is understood that by this approval the undersigned do not necessarily endorse or approve any statement made, opinion expressed or conclusion drawn therein but approve the dissertation only for the purpose it is submitted.

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Abstract

The outbreak of COVID-19 is having an unprecedented impact worldwide and it has affected everyone around it. Healthcare systems and administrations are struggling to keep up with it. India along with other countries is facing many similar challenges in the containment of the virus through strict measures. This study aims to depict the capabilities of India in response to COVID-19 and to assess the response of South Korea in controlling the spread of the virus so as to provide recommendations to strengthen India's fight against this global pandemic. The data has been collected from various ministerial websites (MOHFW, India, My Gov, ICMR, KCDC, MOH-Korea) under 5 major categories which include Response & Preparedness, Disease Surveillance, Laboratory Capacities, HR Capacities, and training and Risk Communication. After analyzing South Korea's response, it was found that Korea's main focus is on screening, testing of more and more individuals; strengthen the contact tracing and taking appropriate quarantine measures. India can adopt few of their strategies that include testing of more individuals via drive-thru testing clinics, self-monitoring symptoms app, E-Quarantine system, etc. apart from Social distancing measures. Also, with and post COVID-19 as we are progressing, we can further strengthen our health system through multi-disciplinary research studies, by using Artificial intelligence-based tools in diagnosis, use of chatbots for E- consultation and training and capacity building of health workforce. These few steps could help to support the vision of digital and Aatam- Nirbhar Bharat.

Keywords: Pandemic, Containment, Quarantine, Response & Preparedness, Lab Testing, Surveillance, COVID-19, Healthcare.

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List of Abbreviation

MERS	Middle East Respiratory Syndrome
CDC	Centre for Disease Control and Prevention
IHR	International Health Regulation
WHO	World Health Organization
KCDC	Korea Centre for Disease Control and Prevention
ICMR	Indian Council of Medical Research
GDP	Gross Domestic Product
RBI	Reserve Bank of India
MoHFW	Ministry of Health and Family Welfare
RNA	Ribose Nucleic Acid
DNA	Deoxy Ribose Nucleic Acid
SARS	Severe Acute Respiratory Syndrome
NAAT	Nucleic Acid Amplification Test
OIE	Office International des Epizooties
FAO	Food and Agriculture Organization
IATA	International Air Transport Association
NIV	National Institute of Virology
NCDC	National Centre for Disease Control
NPSP	National Polio Surveillance Project
NDT	Non-Destructive Test
UNICEF	United Nation International Children's Emergency Fund
ARI	Acute Respiratory Infection
PPE	Personal Protective Equipment's
RRT	Rapid Response Team
VRDL	Viral Research and Diagnostic Laboratory
NHM	National Health Mission
IMCT	Inter- Ministerial Central Teams
MOIS	Ministry of the Interior and Safety

Introduction:

Coronavirus is the family of virus which is common in animals like bats and camels and which can be transmitted in humans also. Viruses of this family have spikes on their surface which probably help them to enter cells and delay the immune response. Common symptoms of this virus include cough, fever and difficulty in breathing and in some severe cases can cause kidney failure and acute respiratory illness like pneumonia and sometimes also leads to death.

Several coronaviruses have spread to humans from animals, contributing in recent years to outbreaks. Middle East Respiratory Syndrome (MERS) was first transmitted from camels to humans in Saudi Arabia in 2012. In one-third of patients, it was fatal and resulted in more than 850 deaths**.** The Coronavirus disease 2019 or COVID-19 has created the worldwide public health crises which have impacted the lives of millions of people around the world. As of today, 213 countries are battling against this deadly virus. Globally the COVID-19 confirmed cases have exceeded more than 2 million.

COVID-19 pandemics have changed how we perceive our world and everything around us. Today focus of every individual around the affected countries is to stop the transmission of virus via social distancing and self-hygiene and quarantine measures.

On 31 December 2019, china has reported cases of pneumonia of unknown etiology which was detected in sea food market of Wuhan city Hubei province. Six days later, Chinese authorities reported that disease is caused by novel coronavirus, usually found in animals. The CDC implemented a COVID-19 Incident Management Program almost immediately on January 7th. On 11 January, China reported its first death from the virus. The patient was a 61-year-old who had contracted the coronavirus at the Wuhan market. Later on Thailand reported the cases of coronavirus followed by Republic of Korea and now it has spread throughout the world.

The US starts screening passengers at New York, Los Angeles and San Francisco airports on January 17th. The first case of coronavirus is identified on 21 January in the United States. The Washington state man reportedly contracted the virus in his 30s after traveling to Wuhan. The virus then started spreading across China, heading to Japan, South Korea, Thailand, and the Philippines. On 29 February a man in Seattle becomes the first citizen in the United States to die of coronavirus.

As of **20th May 2020,** globally 4789205 positive cases have been confirmed with 318789 deaths.(1) WHO and its partner are closely working with the countries to contain the

virus and helped the countries to implement the strategies according in the key areas defined in International Health Regulation (IHR,2005) along with it countries have adopted the additional health measures.

India has reported its 1st COVID 19 positive case on 30th January 2020 in Kerala state but the cases has shot up in large number after that. As of 17 April 2020 no. of positive confirmed cases have crossed 15,000 with 480 deaths(2) According to the experts the number of infected people could be very high as the testing rates in India is lowest among the world. India has adopted various strategies& initiatives to stop the surge in no. of cases and halt the progress of virus such as travel restrictions by stopping both international and domestic flights, social distancing, door to door surveillance and quarantine of cases, converting health facilities into COVID 19 hospitals, rapid testing of patients and locking down the India in the self -quarantine. Along with this India witnessed 14 hours voluntary Janta curfew on 22nd March and further on 24th March Prime Minister Narendra Modi announced the nationwide 1st lockdown for 21 days.

Economic impact:

Globally, the advent of the COVID-19 pandemic has affected the economic, cultural, political, social arrangements of the entire world. Even the countries with largest economies such as United States, China, Britain, Germany, France, Italy, etc. are struggling to keep up with the effects of the pandemic and are on the verge of collapse.

On top of that, financial markets were hammered around the world, and prices of oil have been dropped off a cliff. The unemployment rate in the America has crossed 14.7 %, as in a week around 3.3 million Americans has raised their status to unemployed and a week later another 6.6 million people started looking for jobs. Many economic and financial experts have also taken caution about the global economy and financial system's weakening condition. Due to lockdown in countries, many companies and even small businesses have been got shut and there is still uncertainty regarding the situation of the pandemic that has put many vendors out of the business. Many economists fear, and expect, that the pandemic can lead to recession. Also, Bloomberg Economics reports that "Full-year GDP growth might fall to zero in a worst-case pandemic scenario"

The economic impact in India's due to coronavirus pandemic has been in large part disruptive Various fiscal agencies such as World Bank and credit rating agencies have downgraded India's 2021 fiscal year growth in three decades since India's economic liberalization in the 1990's, with India's lowest estimates. It was predicted that India could

lose around $32,000 crores daily during its initial lockdown of 21 days. It has been estimated that around 53 per cent of companies in the country would be significantly affected.

“Larsen & Toubro”, the big Indian firms “Bharat Forge”, “Ultra Tech Cement”, “Grasim Industries”, “Aditya Birla Group”, “BHEL and Tata Motors” temporarily halted or significantly reduced operations. Startups have also been hit with the decline in funding. The fast-moving consumer goods firms in the country have reduced operations dramatically, and are concentrated on the critical. Some security deals have been affected / postponed due to the pandemic, such as delivery of “Dassault Rafale fighter jets”. India's financial markets announced the worst losses in history on 23 March 2020.

The government of India has taken a range of measures to address the crisis, ranging from food security and extra healthcare funds to sector-related incentives and tax deadlines extended. Recently government has released the economic stimulus package of 20 lakh crores to make “AtmaNirbhar Bharat”. The large amount of funds will go to MSME sector followed by credit facility of five thousand crores for migrant workers, vendors to agriculture and other sectors to boost the economy of India during the pandemic situation.

Aim of the Study:

The aim of this report is to assess the initiatives and strategies taken by India and South Korea and find out the gaps and suggest the recommendations to stop the pandemics in India.

Objective of the Study:

1. To understand the situation of COVID-19 in India and its response towards flattening the curve of coronavirus (reducing the number of new COVID-19 cases from one day to the next.)
2. To compare the India’s and South Korea response to stem the spread of the coronavirus and find out the gaps and challenges
3. To provide the recommendations that can be implemented/ adopted for strengthening the India fight against COVID-19.

Scope of the Study:

This study can help the individual and officials to understand the response and effort of both countries in containment of virus. Also, it will them to remodel or restructure their strategies & initiatives and can pick up the best response.

Research Methodology:

This study uses secondary research to understand the situation of COVID- 19 in India and country response towards containment of virus with focus on decreasing the no. of positive cases each day (flattening of the COVID- 10 curve.)

Data has been collected from official websites and Social media handles (Twitter & Facebook) of "World Health Organization (WHO), Ministry of Health & Family Welfare (MOHFW), Indian council of Medical Research (ICMR),My gov (a dedicated platform which provide information related to coronavirus) for India and Ministry of Health, Korea Center for Disease Control (KCDC) " under the following categories based on the indicators of International Health Regulations (IHR) 2005.

These categories are as follows:

1. Response & preparedness
2. Disease Surveillance
3. Laboratory capacity
4. HR capacity & training
5. Risk communication

The data has been collected for a period of 4.5 months starting from 1 January 2020 till 20th May 2020.

Limitation of the study:

- There was ample amount of data which was difficult to incorporate in the study.
- Time Constraint
- The pandemic itself is a limitation as primary research couldn't be conducted.

About the Organization- IQVIA

IQVIA is a global leader in providing research and consulting in healthcare and life sciences sector .

IQVIA is the world's leading provider of healthcare survey, consulting & health intelligence services with over 60 years of experience. We operate in over 100 countries and serve over 5,000 healthcare customers across 6 continents. IQVIA serves key healthcare organizations and decision makers around the world, spanning government agencies, donor agencies, policymakers, researchers, life science and healthcare companies, consumer health and medical device manufacturers, as well as distributors, providers, payers, and the financial community.

Our global data and analytics capabilities draw on data from 100,000+ suppliers and on insights from more than 55 billion healthcare transactions processed annually. We connect knowledge across all aspects of healthcare to help more than 5,000 healthcare clients globally to improve patient outcomes and operate more efficiently. The depth of experience available through IQVIA is well-recognized in the industry, as is the commitment to monitor and evaluate safety, benefit/risk, efficacy, effectiveness, quality of care and value.

IMS Health recent merger with Quintiles, making IQVIA a leader in global healthcare intelligence and leverage its capabilities to build a differentiated Real-World Evidence solution to help address critical healthcare issues around cost, value and patient outcomes.

IQVIA has significant experience in advising Governments, international NGOs, multilateral funding agencies in the emerging markets in areas ranging from Large scale data collection and research, monitoring and evaluation, capacity building, strategic direction to programme management, supply chain assessment/ management, in country development, pharmaceutical market assessment, health financing, private sector engagement, medicine access, policy and regulatory review, health data analytics etc. Our team have worked on over 200 relevant projects globally and helped some of the world's largest organizations to deliver challenging programmes and projects in the areas of healthcare and pharmaceuticals.

Only healthcare consulting organization with on ground implementation capabilities across Africa, Asia through IQVIA teams and partners and data assets to inform strategy in public and private sector.

Literature Review

Chapter 1 - Epidemiology of the Coronavirus

The COVID 19 outbreak which has started from a sea food market of Wuhan, China and now speeded throughout the world making it a "Public Health Emergency of International Concern". This Coronavirus disease is an emerging disease that means it has never occurred before therefore efforts have been focused on describing the clinical course/epidemiology of the virus. Viruses are the microorganism that depends on its host (human, plant, animal) to replicate itself. When the virus enters the host, it uses the host machinery to replicate their genetic material (either RNA or DNA), and to fight off the virus our body activates our immune system.

A pneumonia cluster with unknown etiology emerged in Wuhan City, Hubei Province of China on 31st December 2019 and it was found out that several initial positive cases have visited the sea food market in china which was found to be the origin of the virus. Later on, with molecular analysis, it was confirmed that the pathogen was a new coronavirus (CoV), which was initially called as 2019-nCoV, and renamed as COVID-19. This new Coronavirus belongs to the Coronaviridae family and is transmitted from animals to humans. These viruses cause mild upper respiratory infections, to pneumonia to severe infections.

First Coronavirus reported in 2003 was severe acute respiratory syndrome SARS in Guangdong Province, which subsequently spread to Hong Kong and then cases were started reporting worldwide. Around 8000 cases were reported from across the world with case fatality rate of 10%. Later on many research studies found that SARS was emerged from bats and is transmitted to humans.

Another Coronavirus of animal origin is MERS 43 "Middle east respiratory syndrome" which came from camels and has high case fatality rate that SARS, but it has difficult human to human transmission. Now in 2019, COVID-19 is caused by SARS – CoV 2 it has emerged from animal and transmitted to humans since that it has affected more than 213 countries across the globe.

Transmission of COVID-19:

As of 20th May 2020, globally 4789205 positive cases have been confirmed with 318789 deaths There are 4 phases of corona virus (COVID-19):

STAGE 1:

The stage of imported cases, which consists of people who have travelled virus hit foreign countries and have travelled back to their native countries. Thus, through this virus tends to spread among people when they encounter infected imported cases.

STAGE 2:

The stage of Local transmission consists of the cases which came in contact with people having traveling history and got infected.

STAGE 3:

The stage of Community transmission, this tends to occur when a patient not exposed to any infected person or one who has travelled to any affected countries tests positive. Large area gets affected when community transmission take place.

STAGE 4:

The stage of epidemic and it is the last stage where the disease takes the shape of epidemic with no clear end point like it happened in China.

Category No.	Category name	Definition
1	No cases	Countries/territories/areas with no cases
2	Sporadic cases	Countries/territories/areas with one or more cases, imported or locally detected
3	Clusters of cases	Countries/territories/areas experiencing cases, clustered in time, geographic location and/or by common exposures
4	Community transmission	Countries/area/territories experiencing larger outbreaks of local transmission defined through an assessment of factors including, but not limited to: - Large numbers of cases not linkable to transmission chains - Large numbers of cases from sentinel lab surveillance Multiple unrelated clusters in several areas of the country/territory/area

Table 1:Stages of Transmission of COVID-19

Source: WHO

Clinical Symptoms:

Major initial symptoms of COVID-19 includes "fever, tiredness & dry cough. Some patients may also experience aches, pains, nasal congestion, running nose, sore throat & diarrhea". The symptoms range from mild to critical. Also, some cases are asymptomatic i.e. they do not develop any symptoms and doesn't feel unwell.

Globally, the case fatality is around 3% which increases for the older people & individuals with predispose medical conditions such as high blood pressure, heart diseases, diabetes and older people are at more risk to develop serious illness.(3)

Case Definition of COVID-19:

Suspect Case:

According to WHO a suspect case is **"**A patient with acute respiratory illness (fever and at least one sign/symptom of respiratory disease, e.g., cough, shortness of breath), AND a history of travel to or residence in a location reporting community transmission of COVID-19 disease during the 14 days prior to symptom onset;"

"A patient with any acute respiratory illness AND having been in contact with a confirmed or probable COVID-19 case (see definition of contact) in the last 14 days prior to symptom onset;"

"A patient with severe acute respiratory illness (fever and at least one sign/symptom of respiratory disease, e.g., cough, shortness of breath; AND requiring hospitalization) AND in the absence of an alternative diagnosis that fully explains the clinical presentation."(4)

Probable case:

"A suspect case for whom testing for the COVID-19 virus is inconclusive or testing could not be performed for any reason"

Confirmed case:

"A person with laboratory confirmation of COVID-19 infection, irrespective of clinical signs and symptoms".

Suspected cases should undergo various testing for COVID-19 such as nucleic acid amplification tests (NAAT), or RT-PCR, serological testing, viral sequencing(5)

Global Surveillance:

Countries may either use Case based reporting or aggregate reporting or combination of both depending on the transmission rate.

Due to daily difference in number of cases WHO along with many other organizations has released Live tracker where one can see reporting of cases on hourly bases.

Below is the recent surveillance data from WHO as of 20th May 2020(6).

Region	Cases	Deaths
Globally	4789205	318789
Africa	65956	1846
Americas	2105670	125843
Eastern Mediterranean	361902	10303
Europe	1928799	169033
South-East Asia	156211	4971
Western Pacific	169955	6780

Table 2:No. of Confirmed cases and deaths region wise

(Source: WHO situation report)

Chapter 2 - WHO Response

PREPARDNESS & RESPONSE:

The main objective of response is to stop the spread of virus from person to person in China and to prevent the cases from spreading globally. The objective can be achieved by combining various public health measures such as rapid identification of cases, diagnosis by early lab testing and management of the cases, contact tracing, infection prevention and control in hospitals, implementation of health measures and risk communication.

On 2 January, the "Incident management system was activated across the three levels of WHO (country office, regional office and headquarters)." WHO developed the case definition and keep on updating it by incorporating new information.

WHO developed the guidelines for laboratory diagnosis, infection prevention, risk communication, communication in health care setting, updated the travel advices for travel and prepared the "disease commodity packages" (DCPs) to address the supply chain for health emergency in management of infected patients.

WHO has designed an online course to create an understanding and create awareness among general public regarding novel coronavirus, its signs and symptoms. WHO initiated working with global expert networks and developed partnerships for infection prevention, laboratories, mathematical modelling etc.

WHO has actively responded to rumors and seek after misinformation through "myth busting" on WHO's social media and its website. WHO and International Air Transport Association (IATA) are working together and have developed the guidelines which provide advice to airport workers and cabin crew based on country queries. These guidelines are available on IATA website.

WHO has been in direct and frequent contact with countries where cases have been identified. The WHO also informs other countries about the situation and offers assistance as needed. The WHO works with network of researchers and other experts to organize global work on- "monitoring, epidemiology, mathematical modeling, diagnostics and virology, clinical care and treatment, prevention and control of diseases, and risk

communication" It has provided provisional guidelines for member states that are periodically revised.

Open WHO is an open, web-based, knowledge sharing network providing online courses to improve response to health emergencies. COVID-19 courses and courses in additional national languages can be found here.

"Specifically, the WHO has built online courses on the following topics:

- Introduction to Go. Data – Field Data Collection, Transmission Chains and Communication Follow-up. The Go. Data platform is accessible internationally to WHO personnel, Member States and stakeholders to support outbreak investigations, with main focus on data collection, interaction monitoring and visualization of transmission chains.
- A general introduction to emerging respiratory viruses, including novel coronaviruses
- Clinical care for Severe Acute Respiratory
- Health and safety briefing for respiratory diseases – ePROTECT "

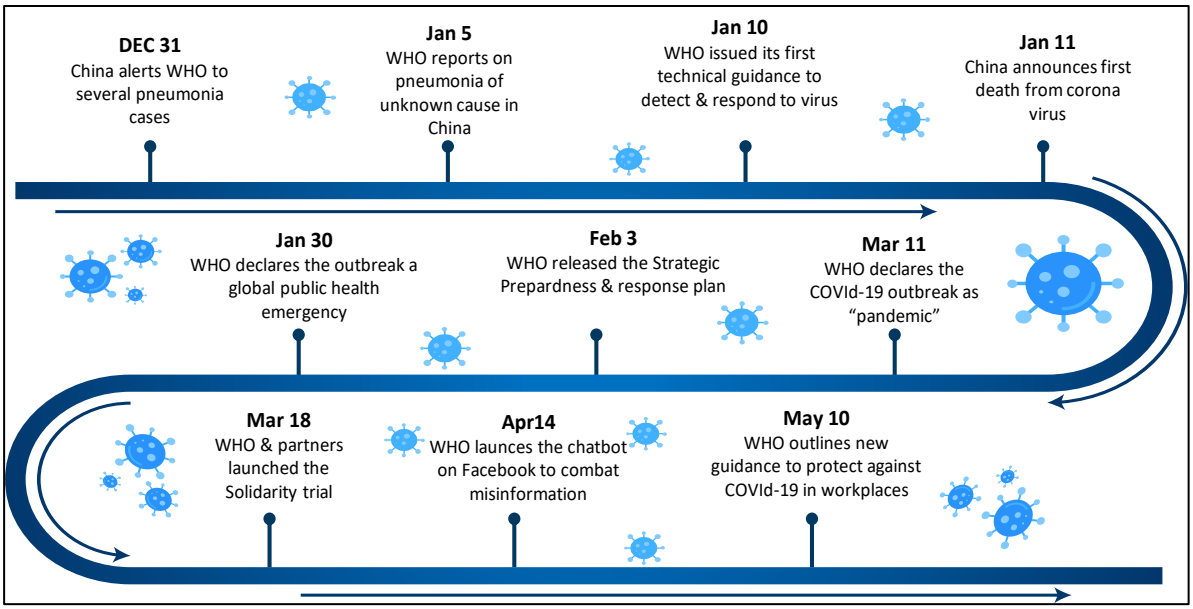

Figure 1: COVID-19 pandemic Progress Timeline

DISEASE SURVEILLANCE:

Since the outbreak of virus WHO starting from 21st January 2020 is releasing the Situation report of novel Coronavirus (2019-nCOV) where they are reporting the surveillance data of no. of positive confirmed cases region and country wise. That help the countries to analyze the situation across the country as well as around the world.

WHO has released the guidelines for the country on the global surveillance of COVID-19 in humans where it has defined the case definition. Along with this, guild lines also recommend active case finding and testing as well as contact tracing in all transmission scenarios. WHO suggests that Aggregate reporting should be considered a temporary stopgap measure only when individual case reporting is not possible.(4)

On 21st January 2020, WHO delegates visited the China and discussed the active surveillance response, temperature screening at Wuhan Tianhe airport, laboratory facilities, infection prevention and control measures at Zhongnan hospital along with its associated fever clinics, and the shipment of diagnostic test kit to detect the virus.

Due to spread of cases to other regions WHO has issued advisory for the detection of cases at airports. It has issued the guidelines to how to detect and take care of ill travelers that are suspect of COVID-19. Countries should perform testing of every suspected case, if individuals are tested positive, they should be quarantined for at-least 14 days and there should be screening of close contacts also. All the confirmed cases from mild to severe infections should be kept in isolation to prevent further spread of virus. Based on the capacities of the country's patients can be prioritize vulnerable groups such as older patients and those with pre-existing diseases.

WHO is also working with notational authorities with Egypt and many other countries to scale up the isolation, Quarantine and referral mechanism. Also WHO regional office, Africa has hosted a virtual platform where it brings together 100 leading innovators to come up with new ideas and solutions to address the COVID-19 pandemics It has received several proposals ranging from mobile based screening, self- diagnosis and mapping tools, to the best 3 proposals WHO and its implementing partners will provide the seed funding

On 14th April 2020 WHO in collaboration with technology companies has released various updates on COVID-19 information dashboard. Now the users can see the dashboard with mobile view along with this user can get country data with interactive maps with just a click. Whereas a new explorer tab will provide the complex data sets for easy access and use.

LABORATORY CAPACITY:

WHO along with the national authorities is working continuously to stop the cases of COVID-19 to become clusters and to prevent clusters from becoming outbreaks through

various steps such as social distancing, quarantine and through testing and diagnosis of suspected cases and their contacts with up to 2 days before developing any symptoms.

Diagnostic testing of suspected cases of coronavirus is critical step in case management and controlling the spread of virus. Therefore, in line with it WHO has released the interim guidelines describing the strategic use of testing kits in different transmission stages of COVID-19, rationalization of testing. Also, guidelines have been provided for laboratory biosafety which includes transportation, packaging & handling of specimens.

WHO is also working towards supply of medical equipment's, personal protective gears to the various countries particularly those which have weaker health systems. It has shipped supplies of PPE kits to around 40 African counties and 29 countries in America. Also, in Tehran, Iran experts have arrived there with medicals supplies and protective equipment's and testing kits to test nearly around 100,000 people and to support more than 15,000 health workers.

WHO, operation support & logistics (OSL) is continuously working to address the supply chain management issues of medical supplies across the countries. "It has shipped more than 900 000 surgical masks, 62 000 N95 masks, 1 million gloves, 115 000 gowns, 17 000 goggles and 34 000 face shields to 133 countries. OSL has also shipped COVID-19 testing kits to 126 countries".

Moreover, "WHO solidarity flight which is a part of larger efforts to ship lifesaving medical equipment's to 95 countries is working across Africa"

RESEARCH & DEVELOPMENT:

On 12 February 2020 meeting of more than 400 experts held at WHO headquarter, Geneva to accelerate the research to prevent the outbreak of COVID-19 by developing easy to apply diagnostic kits, and vaccine development and trials.

Research and development blueprint which includes setting the research in nine key priority areas which includes natural history of virus, epidemiology, diagnostic, clinical management, social sciences, therapeutics & vaccine. This can serve as roadmap. To accelerate R&D 90+ countries have joined solidarity trial to evaluate the safety and efficacy of 4 drugs and their combinations on 900+ enrolled patients. In addition to this they are also working to see the impact of corticosteroids and other anti-inflammatory drugs on treatment outcomes.

WHO is working closely with OIE and FAO to develop guidance on safe operations of markets that sell sea food or animal-based products. As it has been estimated that 70 % of new viruses originated from animals. Therefore, to prevent future occurrence of outbreak and pandemic situations these organizations are working closely to understand and prevent the cross transmission of virus from animals to humans.

HR CAPACITY & TRAINING:

On 25th January 2020 WHO launched the free online introductory course on novel coronavirus with topics like why it is a threat and now communities can respond towards it. This course will help healthcare worker and even individuals to understand and work together towards this global pandemic

More than 11,000 health workers in Africa region have been trained by WHO using online courses. In addition to this WHO has launched "Open WHO Massive online open courses" to provide learning platform for healthcare workers, policy makers and the general public It has more than 32,000 learners enrolled. The courses range from- "Operation planning guidelines to support countries response and preparedness activities, Infection Prevention & Control (IPC), Acute Respiratory Infections (ARIs) and basic hygiene measures to protect against infection, Clinical Care Severe Acute Respiratory Infection and Emerging respiratory viruses, including COVID-19: methods for detection, prevention, response and control".

They have activated global expert networks to tap the world's leading epidemiologists, clinicians, social-scientists, statisticians, virologists, risk communicators & others"-

Till now WHO has provided training to more than 1.5 million health care workers.(7)

RISK COMMUNICATION:

Open WHO, a free, open-access health emergency learning site, now provides 9 online courses related to COVID19. ITU & WHO call on all telecommunications companies around the world to join them in unleashing the power of digital technology to reach billions of people with essential health information on COVID19 that will help save lives. WHO have created a free children's book on COVID19 to increase their level of knowledge and awareness.

Considering the festival of Ramadan in India WHO has requested people to:

- Practice physical distancing by maintaining the distance of 1m at least among people.

- The use of culturally and religiously accepted greetings that avoid physical contact: smiling, nodding, handing over the heart.
- Avoid gatherings.

WHO has created a database on COVID-19 which consists of latest international and multilingual scientific findings and global literature on regarding information about the disease. WHO Health Advisory on COVID19 is now enabled on Messenger http:/messenger.com/t/WHO Remain updated and get correct details on Coronavirus.

For older people which already have some health issues, WHO advice and suggest them to avoid public gathering, postpone any sort of visit during the period of outbreak, try to socialize with friends and family members with phone and social media platforms and perform exercise, yoga and pranayama to reduce the stress.

It is important to main healthy and active every-day, for this WHO recommends:

- All healthy adults do 30 minutes/day of physical activity
- Children should be physically active for 1 hour/day

Many rumors and myth have been created among the mind of people of various countries which is leading to more spread of disease. Thus, WHO actively acted on this and gloated various facts related to rumors spreading among general public such as:

FACT 1: Drinking methanol, ethanol or bleach does not deter or treat COVID-19 and can be highly dangerous.

FACT 2: Exposing yourself to the sunlight or to temperatures above 25C degrees DOES NOT keep COVID-19 from occurring.

FACT 3: Someone could rebound from COVID-19. Catching a new coronavirus doesn't mean you're going to get it for life.

- For women who have recently given birth to babies WHO recommends:
- Close contact and early, exclusive breastfeeding help a baby to thrive.
- A woman with COVID-19 should be helped to breastfeed safely, hold her newborn skin to her skin, and share a room with her baby.
- According to WHO people having disability can reduce their potential exposure to COVID-19 by:
- Avoiding the crowd
- By disinfecting the assistive products more frequently.

WHO developed guidelines for people getting home care with confirmed or suspected COVID-19:

- If you are sick with fever and cough, you should always scrub your hands with soap and water or with alcohol-based hand wash.
- Stay at home; do not attend to college, school or public places. Relax, drink lots of water and consume healthy food.
- Arrange a separate room for the ill member and if not possible then wear a medical mask and maintain 1 meter also keep room clean and ventilated.

WHO has developed interactive chatbot on Viber which provide correct information about novel coronavirus that also in many languages

Chapter 3 - India Response

WHO on 11 March 2020 has declared the novel coronavirus disease outbreak as a pandemic and countries were asked to take immediate actions and scale up their response towards testing, treatment and containment of virus. As of 20th May 2020, 1,06750 total cases have been reported by MOHFW, and 3,303 death. and total individuals tested were 2834798.

State wise, Maharashtra has highest no. of active cases followed by Tamil-Nadu and Delhi being the third highest**.** Overall recovery rate of India is 40%(8) with case fatality rate of 3.2 % which is 65% in males & 35% for females. The 1st case of coronavirus was confirmed on 30th January 2020 in India was reported from Kerala. The patient had a travel history from Wuhan, China. Since then our Prime Minister Shri Narender Modi have been closely monitoring the Cov-19 situation and has initiated many preparedness & response efforts.(9)

PM Modi called "**Janata curfew** "on 22 March 2020 from 7 am to 9 pm urging people to voluntary stay at homes and show their support and gratitude to the frontline workers who are fighting for us against virus by risking their own life. After that analyzing the situation of rapid increment in no. of positive cases both state and central government has called the Lockdown for 15 days starting from 23rd March 2020 to 15 April 2020 which was further extended to 3rd May 2020. During the lockdown all the people are requested to stay at homes except those in essential services, enforcing public led social distancing measures.

The state government along with central government has taken several steps to prevent the spread of coronavirus cases which includes participation in lockdown, enforce social distancing measures with help of corona warriors, building of shelters and providing foods to migratory workers and homeless, relief funds to daily wages workers, and also strengthen the health infrastructure for the treatment of patients with coronavirus etc.

Despite being the world's 2nd most populated country, India when compared with other countries has understand and analyzed the seriousness of the situation and has ramped up its response and preparedness activities very early which is one of the main reasons that

India has somewhat controlled and is on the way of controlling the rise in number of coronavirus cases.

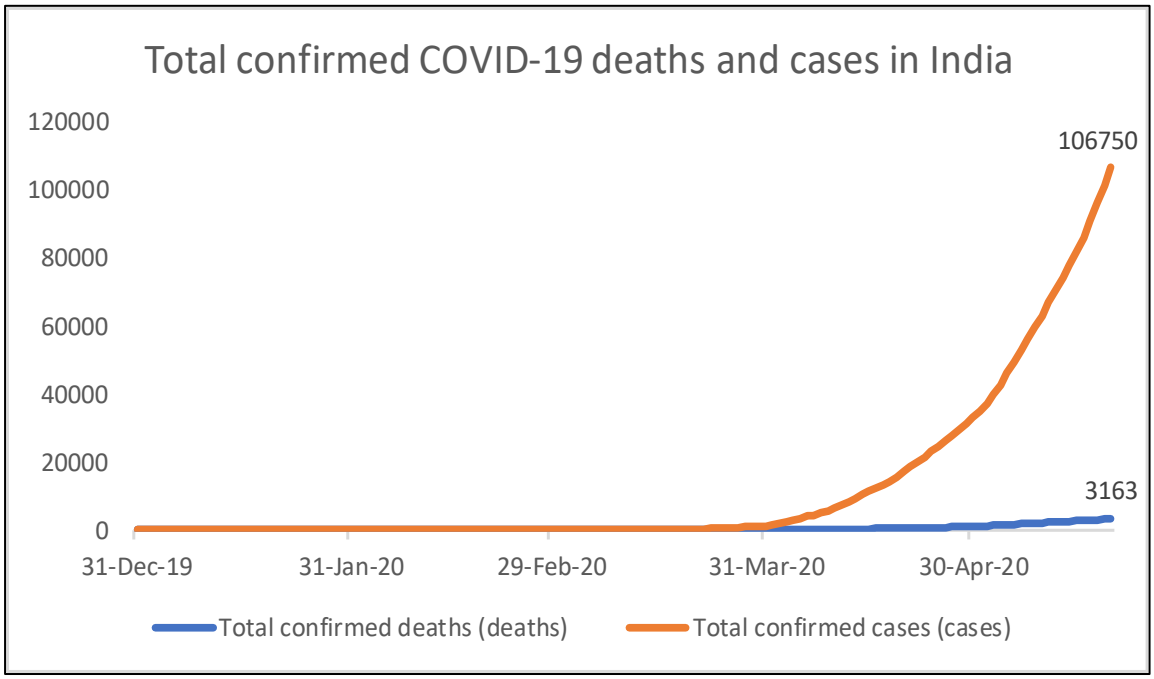

Figure 2: Graph showing total confirmed cases and deaths of COVID-19 in India

RESPONSE AND PREPAREDNESS:

Ministry of Health, Family and Welfare (MoHFW) and the Prime Minister's office closely track the 2019-nCoV situation and step up preparedness and response efforts. Public health preparedness including diagnostics, surveillance, hospital preparedness, logistics, infection prevention and control and risk communication is continuously being reviewed by the state and national health authorities.

Initially Ministry of Civil Aviation and MoHFW initiated inflight announcements and screening of travelers for the symptoms of cough and fever coming from china and various other countries. Along with this travel advisories were also issues. National institute of virology (NIV), initiated the sample testing for COVID-19. From 31st Jan additional 12 labs also started functioning for testing the samples.

Gram panchayats are being held in villages bordering Nepal to make people more aware of the signs, precautions and steps taken by the Governments for the prevention and control of 2019-nCoV. Creation and adaptation of information education and communication (IEC) materials in local languages were carried out by the State concerned.

Initially during breakdown designated aero bridges were used at seven international airports (Delhi, Kolkata, Mumbai, Cochin, Bengaluru, Hyderabad & Chennai) to screen passengers from China, Singapore, Thailand and Hong Kong to reduce the possibility of transmission. The 24x7 Control Room (011-23978046) has been operationalized and IEC materials are widely disseminated across various contact platforms, such as paper, online and social media.

WHO Country Office for India (WCO) works closely with MoHFW professional agencies, including the National Center for Diseases Control (NCDC), the Indian Medical Research Council (ICMR) and the Ministry of Information and Broadcasting on disease monitoring, laboratory test capability and risk communications. WCO is delivering regular reviews and strategic advice on risk management, preparedness and response to the Joint Monitoring Committee on Emerging Diseases, which brings together agencies and line ministries.

The WHO field team facilitates the identification of travelers arriving from China, the recruitment of medical officers and rapid response teams, the participation of state and district representatives of the IDSP in cooperation and support, the exchange of regular information at state and district level, and assistance in airport evaluation and the translation of COVID-19 instruction materials into local languages in several countries. A buffer stock of personal protective equipment (PPE) and N95 masks is maintained by the states as well as Union Government.

On 6 March, MoHFW and WHO organized a National Training of Trainers (ToT) to support COVID19 with a focus on strengthening Infection Prevention Control, Surveillance and Risk Communication and Community engagement. The Janta Curfew was declared by Prime Minister in order to contain the spreading of virus and then lockdown was declared to deaccelerate the spread of infection(10)

The Ministry of Health and Family Welfare (MoHFW) routinely assesses quarantine facilities and preparedness for hospital management, such as OPD blocks, availability of test kits, personal protective equipment (PPEs), medications, and enough insulation wards. The Ministry of Pharmaceuticals and Consumer Affairs has released an advisory to take the requisite steps to control the price of masks, sanitizers and other logistic material related to health and to promote their availability in all hospitals and for people as a whole.

Various state level measures were taken in response to COVID-19 such as: activation of State Rapid Response team, closure of cinemas and educational institutions, training of health professionals and designating hospitals for COVID-19 treatment, restricting the mass gatherings and activating helpline number for COVID-19 in all the states. WHO NPSP, NTD, CVHO and TB field teams are helping MoHFW state and district officials to access functionality various district hospitals which are dedicated for COVID-19.

PMO has sanctioned INR 15,000 crores COVID-19 Emergency Response and Health System Preparedness Package; INR 7,774 crores for immediate response and medium-term rest assistance (1-4 years). Government of India has launched the ArogyaSetu mobile app (02 April) through a public-private partnership to allow people to assess their risk of COVID infection (in line with data protection and privacy parameters).

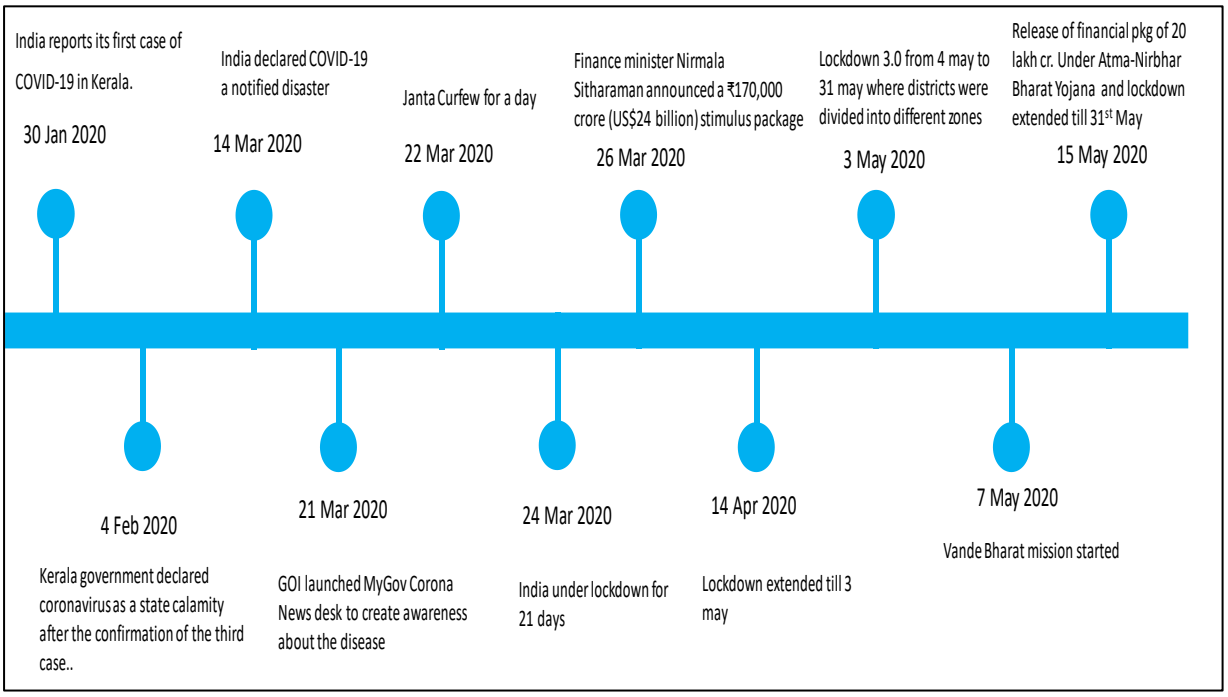

Figure 3: timeline for progression of COVID-19 pandemic in India

DISEASE SURVEILLANCE:

Disease surveillance is an important part in containment and management of COVID-19 cases as it is an infectious disease with high rate of transmission from person to person. Therefore, it becomes very important to trace the positive/ suspected cases, their contacts so that they can be tested, isolated in quarantine centers and can be treated.

GOI in coordination with central and state government has speed up their surveillance system very early starting from the date when cases from reported from China itself. This

is also one of the main reasons that India has succeeded in controlling the rise of no. of cases of coronavirus disease.

India has started the thermal screening of all the international and national passengers at the airports in order to identify the suspected and confirmed cases of coronavirus, to isolate them in order to stop the transmission of virus in the country.

Integrated disease surveillance response has started the surveillance system, with decentralized data reporting from 37 states and 734 districts.(11) They have also introduced the dashboard with real time data reporting of not only of the cases but also of the isolation beds, PPE kits & other logistic and supply chain that helps the officials to forecast the future need via use of epidemic intelligence and data analysis to support the states and districts.

This real time data reporting also helps in identification of hotspots- where there are large number or cluster of cases and help in cluster containment and community transmission of virus.(12)

State and district level surveillance Response;

The surveillance team consist of Rapid response team RRTs which includes Epidemiologist, Microbiologist and Any other person deployed as per need at district/state level which work in coordination with central RRTs. These teams are further lead by DM/ collector in respective districts. These RRTs conduct house to house search, identify the cases, isolate them and send them to quarantine centers/ hospitals for treatment and management.

RRTs will also list the containment zones based on the extent of cases/contacts listed and mapped by them. With the containment zone each case will be considered as epicenter. Furthermore, RRTs will assist states in planning and implementing containment strategies, sample transfer to designated laboratories, setting up of COVID-19 control room, assist states in their contingency plans which includes identification of isolation beds, PPE kits, ventilators, healthcare workers, etc.(13)

Apart from this government has released **the micro plan for containing local transmission of COVID-19**(14) in which surveillance plays a major role. This plan includes various steps:

Objective: to contain cases of COVID-19 in defined geographic areas.

1. Mapping of the affected area- zones will be decide by rapid response team with additional buffer zone of 5 km radius.

   Each containment zone will be then divided into 50 houses with every confirmed case to be considered as epicenter.
2. The management of each containment zone will be led by DM/ collector as nodal person.
3. This plan has also defined the duties & responsibilities of various health worker as mentioned below:
   i. ASHA/ ANM/ Anganwadi:

      Daily House- house search of suspected cases, contact tracing, line listing, close monitoring of the contacts, coordinate with supervisors regarding suspected/ Confirmed cases, community engagement.
   ii. LHV/ MPW/ MW:

      Supervision of epicenter. Reporting of real time data of COVId-19 cases.
   iii. Block Extension Educator and other Communication Staff:

      Public information, education & communication (IEC) activities, Behavioral change communication (BCC) to reduce stigma and discrimination.
   iv. Village Panchayat/ Municipal staff:

      Create awareness in the community and encourage the community members to follow general prevention and precaution activities.
   v. Supervisory officer:

      Supervision of field work, verification of cases, transfer of suspected cases to health facility, random checks and daily reporting to COVID-19 control room.
   vi. Block NHM Manager/ DM

      Information management, finances management and contingency funding of containment activities.
4. Surveillance:
   i. Active Surveillance: each health care worker will cover 50 houses with listing of their information according to the forms. This included identification of suspected cases of suspected cases by ASHA/ ANM/ Anganwadi workers under supervision of medical officer/ LHV
   ii. Passive Surveillance:

Listing of all the health facilities under containment zones with reporting of cases to supervisory officer.

5. Contact Tracing:
   Supervisory officer will inform the contacts of laboratory confirmed cases to the control room which in turn will inform the supervisory officer of concerned sectors for surveillance of contacts.
   The contacts will be traced by ASHA worker and will be monitored for clinical symptoms for 28 days in total.
6. Laboratory support:
   The central/ state RRTs microbiologist will identify nearest VRDL network laboratory for logistic support for sample collection, packaging & transportation.
7. Identification of health facility, ambulance will be managed by RRT team.
8. Additional Logistic support.

These guidelines are followed throughout the India that is helping in controlling the surge of cases. Another initiative that help strengthen the surveillance response is Lockdown initiative which is helping in breaking down internal transmission of cases through identification of hotspots and management and supervision of hotspots by following the above guidelines.(15)

Despite government best efforts for effective lockdown there have been no. of incidence been reported of breakdown of lockdown in many parts of the country which pose a great risk for spread of COVID-19. These violations range from violence against healthcare workers, attacks on police force, violation of social distancing measures in marketplace and opposing to quarantine and unnecessary gathering and visiting of people at public place.

By understanding the seriousness of situation central government has constituted six Inter- Ministerial Central Teams (IMCTs) two for Gujrat, and one each for Telangana, Tamil Nadu, Indore and Maharashtra. In which 4 more teams have been added for Ahmedabad, Surat, Chennai. These team are led by additional secretary and include public health specialist and disaster management teams. These team will make on site assessment of the situation and the issues faced in that area by the officials and will direct the necessary actions to the state authorities for its redressal and submit their report to the central government.

IMCTs focus on range of issues which includes compliance and implementation of lockdown measures as per guidelines issued under Disaster Management Act 2005. Supply chain management of essential commodities, social distancing norms in marketplace, Preparedness and response of healthcare facilities, safety of healthcare workers, availability of PPE, testing kits, and monitoring the conditions of the relief camps for labor and have nots along with quarantine centers. If anyone is found to violate the above mentioned, strict actions can be taken against them under "Section 35(1), 35(2)(a), 35(2)(e) and 35(2)(i) of the Disaster Management Act 2005."

LABORATORY CAPACITY:

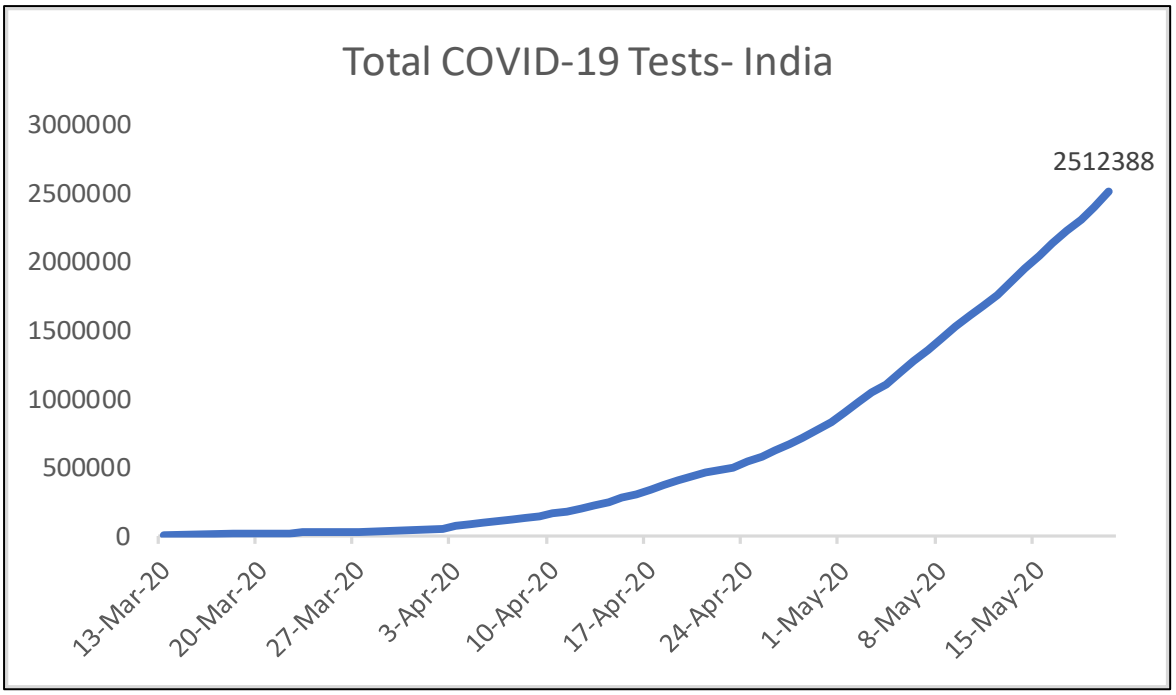

Figure 4: Graph depicts total COVID-19 tests conducted in India

ICMR serves as a reference laboratory for testing of COVID-19 cases(16) with government and private laboratories. Since there are shortage of testing kits, they have developed the strategy which includes the list of individuals to be tested.(17)

i. "All symptomatic individuals who has a travel history in last 14 days.
ii. All symptomatic contacts of lab confirmed cases.
iii. All symptomatic healthcare workers.
iv. All patients with severe acute respiratory illness.
v. Asymptomatic direct and high-risk contacts of positive cases should be tested in interval of 5- 14 days of coming in contact with the confirmed case."

Whereas in hotspots and containment zones as per MOHFW.

vi. "All symptomatic ILI (fever, cough, sore throat, runny nose)
Within 7 days of illness- rRT- PCR, after 7 days antibody test. (if negative, confirmation by rRT- PCR)"

Recently ICMR has expanded its strategy by including pregnant women who are residing in clusters/ containment zones or in large gathering areas/ evacuation centers from hotspots districts due for delivery of baby or likely to deliver in next 5 days should be tested even if they are asymptomatic. Also, ICMR has initiated sentinel surveillance to detect the transmission of virus in the community. Till now there are 51 sentinel sites.

Apart from this GOI has issued various guidelines such as clinical management of COVID-19 triage, implementation of Infection, Prevention & control (IPC) measures, Dead body management. Guidelines have also been issued for private sector laboratories who are performing COVID-19 testing including sample collection, packaging and transportation. Today around 104 public labs are conducting testing for COVID-19 with 15 private labs in 7 states are functional.

RESEARCH & DEVELOPMENT:

In view of spread of COVID-19 many research activities are going across India as given the lack of vaccine and other chemotherapeutic interventions. Some of them includes:

The Ministry of Science & Technology and Ministry of Health & Family Welfare along with their various departments are contributing towards various R&D initiatives to combat this pandemic. The Dept. of Science & technology has launched the nationwide exercise to get innovative solutions and supporting those solutions via seed funding a scale-up support.

All the academic and research institutions are working towards development of vaccine, antivirals models and other solutions to cure this disease. Council of Scientific Research (CSIR) is working with private sector to develop solutions for COVID-19.(18)

Some of innovations operating in various parts of country are like foot operating washing station implemented at Indian Astronomical Observatory (IAO), Henle, Ladakh.

When the test results for COVID-19 used to take around 24 hr, Chitra Gene LAMP-N can provide the results in just 2hr. this test kit is funded by Department of Science & technology (DST). Women of Hoshiarpur, Punjab and many other states in their homes are making low cost budget quality masks and distributing them to the needy and vulnerable population free of cost.

HR CAPACITY & TRAINING:

MOHFW in partnership with WHO has conducted orientation on COVID-19 preparedness & response and containment of virus for all the official members in states/UTs. The same orientation has been rolled out in 723 districts across India. MOHFW has also released guidance to the states in regard to management of COVID-19 cases.

NHSRC has been appointed as a designated center to facilitate training of frontline health workers with respect to their role in management of COVID-19. MOHFW with assistance from WHO, India is preparing the training content for frontline health workers. Also, Empowered Group-4 has been setup specially for COVID-19 at national level for augmenting human resource and capacity building.

Training resources for medical and non-medical staff on infection prevention & control, clinical management of cases, etc. is updated regularly on website. Online training courses & webinar are being conducted by AIIMS, Delhi on clinical management of COVID-19. Diksha Platform- Integrated online training portal has been utilized for training of healthcare professionals across country.

Currently there are 12 courses in different languages that are updated regularly on government website.(19)

- Basics of COVID-19
- Quarantine & isolation
- IPC
- Psychological care of patients of COVID-19
- Infection prevention through PPE
- Laboratory sample collection & Testing
- Clinical management of cases
- Management of COVID-19
- ICU care and ventilation management

Till date 1.77 lakh enrollments have been made on online platforms. Apart from this a dashboard has been prepared to map available workforce including trainee, volunteers and the training sessions taken by different bodies.

RISK COMMUNICATION AND COMMUNITY ENGAGEMENT:

Community participation is a requirement for risk management and communication, which includes effectively communicating the virus-related threat, instilling the correct practices and marking, and combating rumors and stigma. To improve access to accurate information, WHO has partnered with WhatsApp and Facebook to launch a messaging service to the WHO health alert. This service will include the latest COVID-19 news and updates including symptom specifics and how people can protect themselves.

WHO is supporting UNICEF, MOHFW and various other partners in order to establish Interfaith Corona Coalition to engage different religious communities in steps against Novel Coronavirus. WHO supports MOHFW and its collaborators in carrying out a participatory survey to determine the situation of COVID-19 awareness in urban slums.

WHO supports MoHFW in a campaign to tackle the problem of stigma, both against positive cases of COVID and against the medical community in society. COVID-19 National ToT of Frontline Workers' Kit was held on March 28th via Zoom, with more than 1000 participants from across linked states(10)

It crossed more than 81 million on social media. On average the material of UNICEF is viewed 5.4 million times a day. One COVID-19 video on TikTok has over 280 million views. UNICEF is helping the government in Uttar Pradesh and Bihar to mobilize the Social Mobilization Network (originally set up for polio vaccine campaigns) and Jharkhand State I to mobilize village-level cadres to work with IEC district health teams and encourage WhatsApp village-level group for COVID-19 message dissemination and handwashing promotion.

UNICEF is recruiting faith-based leaders at state and district level in Rajasthan and West Bengal for national roll-out to encourage preventive activities on COVID-19. Ministry of Health and Family Welfare worked out good IEC material there by providing general information on COVID-19 and basic health hygiene concepts.

Press conference are held on regular basis by Chief Ministers and Prime Minister in order to make people aware about situation and formulation of various policies in response to COVID-19.

LOCKDOWN 3.0:

India has extended its second lockdown for another 15 days from starting from 4th May 2020, but this lockdown comes with certain relaxations specially in those areas which has shown no increase in COVID-19 cases or has never had a case. To provide the certain

relaxations states and districts are dived into zones which are green, orange, red and containment zones to start the economy activities and side by side control the spread of virus.

The zones are identified based on the risk profile of the districts

Zones	Definition
Green	Districts with zero confirmed cases till date or the district with no confirmed case from past 21 days.
Red/ hotspots	Based on no. of active cases, doubling rate of confirmed cases, extent of testing and surveillance districts will be identified by GOI and MOHFW
Orange	Districts which are neither red nor green zones shall be considered as orange zones

Table 3: Definitions for districts for various zones

(Source: MOHFW)

The zones number will be changed weekly after the review by ministry also the zones can be converted based on the assessment of the district. For example, if an orange zones does not show any confirmed case for 21 days it can be then considered as green zone.

Based on the zones relaxations and activities are allowed which are as follows.

Protocol in containment/ Red zones:

1. Contact tracing followed by home quarantine/ hospitalization if needed
2. Testing of all the cases with symptoms of severe acute respiratory infection or any other symptoms as specified.
3. Active surveillance and clinical management of cases,
4. Effective communication (risk communication)
5. There will be strict measures to ensure no movement except for medical emergencies and essential services.

Activities in Red zones:

Activities that are prohibited include movement of cycle, autos, taxis/cab, inter and intra district movement of buses and spa, salons will not be open. Certain movement will be allowed but with restrictions such as four wheelers with maximum of two passengers and for two-wheeler pillion rider will not be allowed.

Some industrial activities related to production, medical devices, raw material and their supply chain manufacturing will only be allowed in urban areas with social distancing measures, Construction activities with in situ labors in urban areas, The shops in colony and neighbored will allowed to be open despite their status., E-commerce activities of only essential goods etc.

Activities in Orange zone:

Prohibited Activities: inter and intra district movement of buses. Certain activities will be allowed with restrictions such as movement of taxis/cab with 1 driver and 2 passengers only, inter district movement of individuals & vehicles only for permitted activities.

Activities in Green zones:

all activities are permitted in green zones expect for those which prohibited across nation despite the zones. Buses and bus depots will operate in these zones with 50% of capacity. Despite all this there are certain activities which will be prohibited till further notice such as all domestic and international travel via flights, train, buses except those allowed by government., all educational institutes, metro services, malls, restaurants, religious houses any entertainment/ cultural/ religious/ social/ political gatherings.

Apart from this movement of people who are not a part of essential services will be prohibited from 7am to 7pm. In all zones the children, elderly and pregnant women shall stay at home. OPD services will not be operated in containment zones.(20)

LOCKDOWN 4.0

The nation-wide 3rd lockdown in India ended on 17 May-20 till 31st May 20, marking the beginning of lockdown 4.0 where focus will be more on to boost the Indian economy while following the social distancing norms.

Before the commencement of lockdown 4.0, PM Shri Narendra Modi has announced the release of package of 20 lakh crore under the Atma-Nirbhar Bharat Yojana that will act as financial stimulus and will cater different sections such as MSME, laborer, middle class and industries.

Finance minister Ms. Nirmala Sitharaman has announced 15 different packages of 6 lakh 40 thousand crores that will benefit different section of society. The delineation of red, orange and green zones will now be decided by state governments and Union Territories.

Chapter 4 - Republic of South Korea Response

First case in South Korea was confirmed on 20 January and continued the spread of pandemic in country. By 19 Feb the confirmed cases raised by 20 patients and by 58 or 70 on February 20, totaling to 346 case till 21 Feb 2020. In accordance to Korean Centers for Disease Control and Prevention (KCDC), the unexpected leap was mainly due to "Patient 31" who attended a meeting at the Shincheonji Church of Jesus in Daegu 's Temple of the Tabernacle of Testimony.

Mass gatherings in the affected cities have been cancelled amid concerns of more pollution and a few soldiers in isolation in Daegu. On February 4, South Korea started refusing entry to foreigners traveling from Hubei Province to prevent spread of COVID-19.

South Korea, along with Taiwan, Vietnam and Singapore, launched what was perceived to be one of the world's biggest and best-organized disease prevention programmes. Different steps are being taken to test among general people for the presence of virus and, without further lockout, isolate the infected individuals and locate & quarantine anyone who have been in contact with them. South Korea 's rapid tests and thorough monitoring has been deemed effective in reducing the outbreak 's spread.

South Korea combined tests with contact tracing in order to contain and combat the virus. Infected South Koreans in government shelters are expected to get into isolation. The credit card data and phones of infected people were used to map the previous movements. Many that are likely to be close to the infected person receive phone warnings that provide information about their previous movements.

In accordance to Chun Byung-Chul, working as epidemiologist in Korea University the priority for hospitalization is given to patients with high risk and have illness. Patients having mild symptoms were sent to "re-purpose corporate training centers and spaces funded by public institutions," and were given with medical assistance and observation.

Patients are released that are twice recuperating and tested negative. For two weeks of self-quarantine, close contacts and infected persons with minimal symptoms who can measure their own temperatures and whose family members are free from any chronic disease are needed. Frontline health workers contact the individuals under self-

quarantine twice a day to check for any symptoms and to ensure they stay inside in isolation.

RESPONSE AND PREPAREDNESS:

Screening and quarantine measures were enhanced specifically for the individuals entering from Wuhan after the outbreak was declared. After detection of case in South Korea the Republic of Korea Government change its infectious disease alert category from Level 1(Blue) to Level 4 (Red).

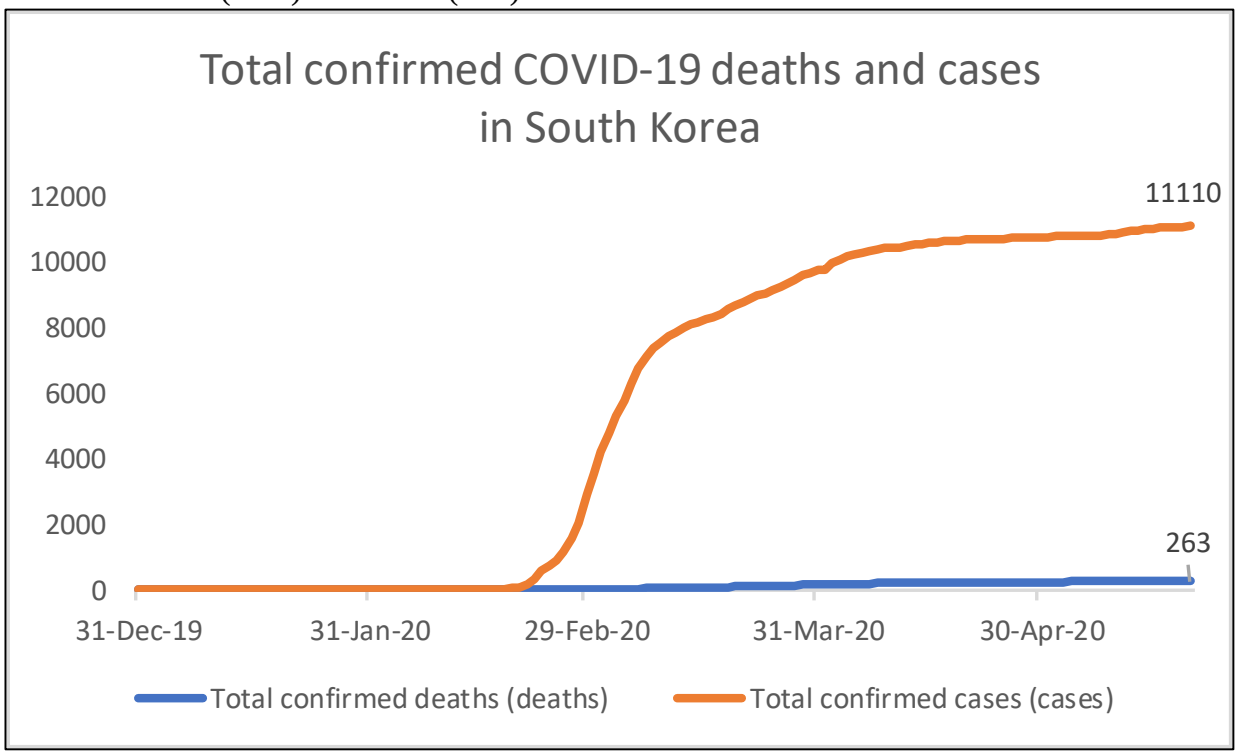

Figure 5:Graph shows the Total Confirmed cases and deaths of COVID-19 in South Korea

ROK Government mandated for all the people travelling from Wuhan, china to Korea to report the fever or respiratory symptoms to a quarantine officer and submit a health questionnaire. KCDC (Korea Centre for Disease Control and Prevention) expanded its case definition of infectious areas in order to include all of mainland China.

The National Health Insurance Service and KCDC introduced 1339 call center as a resource which is available to public to consult a healthcare worker and avoid going outside. The Ministry of Health and Welfare announced epidemic prevention budget of 17 Million USD and plan of sending chartered flights to Wuhan and other surrounding area to bring Korean people back home.

The Korea Occupational Safety and Health Agency initiated supplying 7,20,00 masks to workplace which includes manufacturing, Construction and service industries which are more vulnerable to COVID-19 due to presence of large number of foreign employees.

ROK Government ensured availability of newly developed Test Kits which have the capability to produce results in 6 hours at health facilities. Government kept on increasing the number of screening clinics and supply of diagnostic test kits to test every individual having slightest symptoms.

With the surge in cases the central government dispatched a special task force to implement measures of disease control in Daegu city with government. Ministry of Health and welfare launched “Public reassurance hospital Program” that separates non respiratory disease patients from respiratory disease patients and allows them to consult doctors and physicians and receive their prescription virtually.

In month of February only government changed its Infectious disease alert level from Level 3 (Orange) to Level 4 (Red), the highest category. The first Drive Through testing start operating at KYUNGPOOK NATIONAL UNIVERSITY CHILGOK HOSPITAL. The Ministry of Economy and Finance announces rent costs for small and medium enterprises will be reduced for 6 months 20-35 per cent.

The Government announced a GPS enabled application that will track the movements of quarantined individuals and will set off an alarm in case if infected people leave the designated quarantined spots. Thus, it will help in enforcing self-quarantine measures.

Ministry of Education postponed the initiation of new sessions of Elementary, Middle and High School. MOHW postponed reopening of community childcare centers. Special Immigration Procedures were implemented that includes both Korean and Foreigners which enters Korea. In this the travelers are required to submit their contact information, domestic address, a questionnaire, get their temperature checked and report their daily symptoms by using self-diagnosis mobile app for 14 consecutive days after their arrival.[i]

The government establishes and operates an open screening clinic ("open walk-thru station") located outside Incheon International Airport to detect rapidly COVID-19 infections of asymptomatic foreign entrants to the nation. Built in a large outdoor space without walls, the open screening clinic has the purpose of ventilating through natural wind all the time.

Ventilation time is not needed thanks to natural wind. The risk of contamination by touching surfaces is small as the room is open, which makes this ideal for fast and safe collection of samples for many people. In general screening clinics, a sample may be collected every 30 minutes from a single person due to disinfection and ventilation, whereas the open form can collect a sample every 4 to 5 minutes.

The South Korean Government introduces a credit-based program called 'Fast Scheme on Financial Support Execution for Small Businesses' in order to provide small business with financial assistance. The Ministry of Economy and Finance declared reduction in rest cost up to 50% for small and medium enterprises and 20% for large enterprises for 6 months.

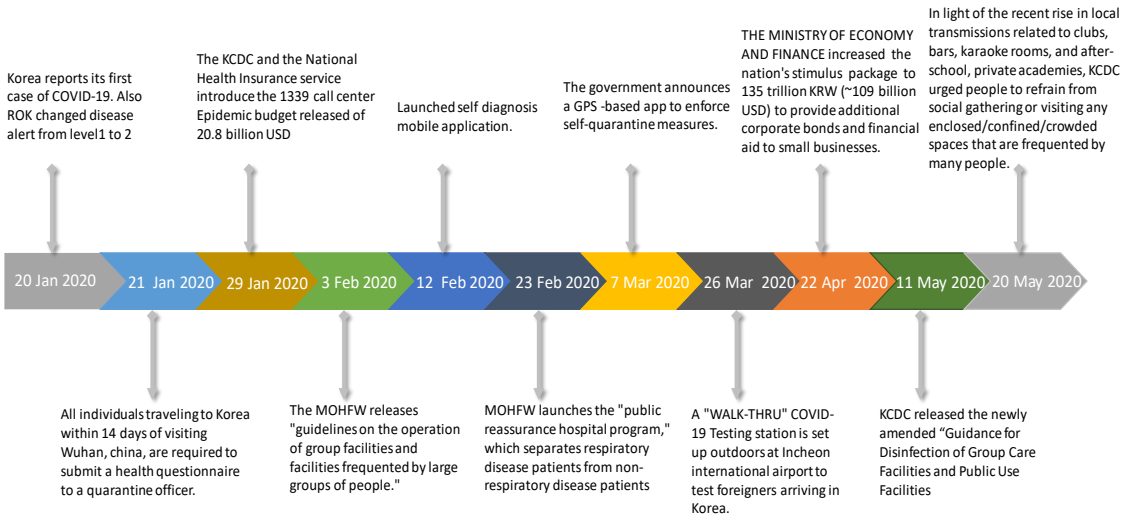

Figure 6:South Korea timeline in response to COVID-19

DISEASE SURVEILLANCE:

South Korea has reported its first case of COVID-19 in January when a woman is travelling from Wuhan, China. The case was detected due to presence of thermal scanners and entry screening of passengers at the Incheon International Airport.

After this Korean government has scaled up their interventions from Blue (Level1) to yellow (Level-2) national crisis management system. They have strengthened the surveillance for the pneumonia cases in the health facilities starting from 3rd Jan 2020. Also, quarantine measures and screening of passengers have been increased from travelers from travelers of Wuhan at all point of entries.

ROK has also started to strengthen the contact tracing of the COVID-19 positive cases starting from the first confirmed case. All the contacts are actively monitored through local health facilities.

The contacts will be monitored for 14 days and will receive a call from health staff on first, second and seventh day for confirmation of any symptoms. If they show any symptom, they are isolated and tested. The government has expanded the screening clinics run by local government to detect and isolate the cases as early as possible.

Till now they have 532 screening clinics being operated in Korea. The inspection and monitoring of travelers are being conducted in collaboration with Korean National Police Agency. All the travels from china are requested to submit health questionnaire form to quarantine officer at point of entries. If any false information is provided on travel history or symptoms, they could be charged a fine of 10 million Korean won (USD 10,000)

The travel history is checked by healthcare providers via Patient Status Checking System, International Traveler Information System (ITS), and Drug Utilization Review (DUR). The information checking rate through these systems drastically rose from 54.1% to 82.1% over the past six days, powered by system improvements and aggressive publicity.

The government has also allowed pharmacies to check the travel history of the patients and take prompt actions when deemed necessary. To this pharmacy computerized system related to patient status checking system. On February 2nd Korea has put the travel restrictions for the people coming from high risk regions of China. And has made self-isolation for 14 days compulsory for all passengers. If someone found to be violating this will be charged KRW 3 million.

IMS has implemented measures to block the entry of virus in Korea such as self-diagnostic app to monitor health conditions of both Korean and foreign nationals, collection of these self-diagnostic results and quarantine of necessary cases. Ministry of the Interior and Safety will take full responsibility for closely monitoring and stringently managing those under isolation in cooperation with local governments, police, etc.

The police and local governments work together to respond and rapidly act in the cases of those who fail to abide by isolation requirements and those whose whereabouts are unidentified.(21) The amendment bill of the Infectious Disease Control and Prevention Act has been tabled to increase the fine for those who fail to abide by isolation requirements.

On site epidemic prevention and epidemiological investigations are being conducted by immediate response teams. Goyang city was first to start relief car screening clinics that allow to take a car, ask questions and prescribe or inspect the car. The ROK has launched GPS based app to enforce self-quarantine measures.

LABORATORY CAPACITY:

ROK has acted fast in screening, testing and isolation of COVID-19 positive cases. In the January itself when they have 4 confirmed positive cases, they have called for a train

station meeting which includes 20 medical companies. After the week of meeting Korea CDC confirmed the testing kits from those companies.

After this South Korea has tested over 290,000 people and identified over 8000 cases. Currently, 29 hospitals with 161 beds have been designated for the hospitalization of confirmed and suspicious cases(22). Apart from this government is working to convert regional hub hospitals and infectious disease control organizations as COVID hospitals.

The COVID-19 testing techniques and data is provided to private health institutions to enable them to diagnose the cases.

Infection control guidelines has been distributed to welfare facilities serving seniors, people with disabilities, etc., that are more vulnerable to infection to place on leave those staff members who visited Hubei within the past 14 days. The hospitals have reduced the regular consultation services to focus on coronavirus infection cases. Also, to further reduce the possibility of infection with health institution premises visitors are screened for temperature before entering any emergency health center.

Currently, 18 health research institutes of public health & environment that are working towards testing and diagnostic examination of suspected cases. Supplies of diagnostic kit has been increased from 200 to 3000 per day.

IMs has developed negative pressure isolation rooms at regional hub hospitals, infectious disease institutions and 198 bed government hospitals. The central clinical TF operated by national medical center has established the guidelines for standard treatment procedures. Government has also announced to buy 80% of mask produced in the country and implement 5-day rotation system allowing 2 masks to be purchased by one person. At the Incheon international airport, a walk thru testing stating for covid-19 has been set up for foreigners arriving to Korea.

HUMAN RESOURCE CAPACITY:

Seeking to the gravity of the situation ROK Government increased the number of staff members i.e. approximately 250 people from Ministry of National Defense, Korean

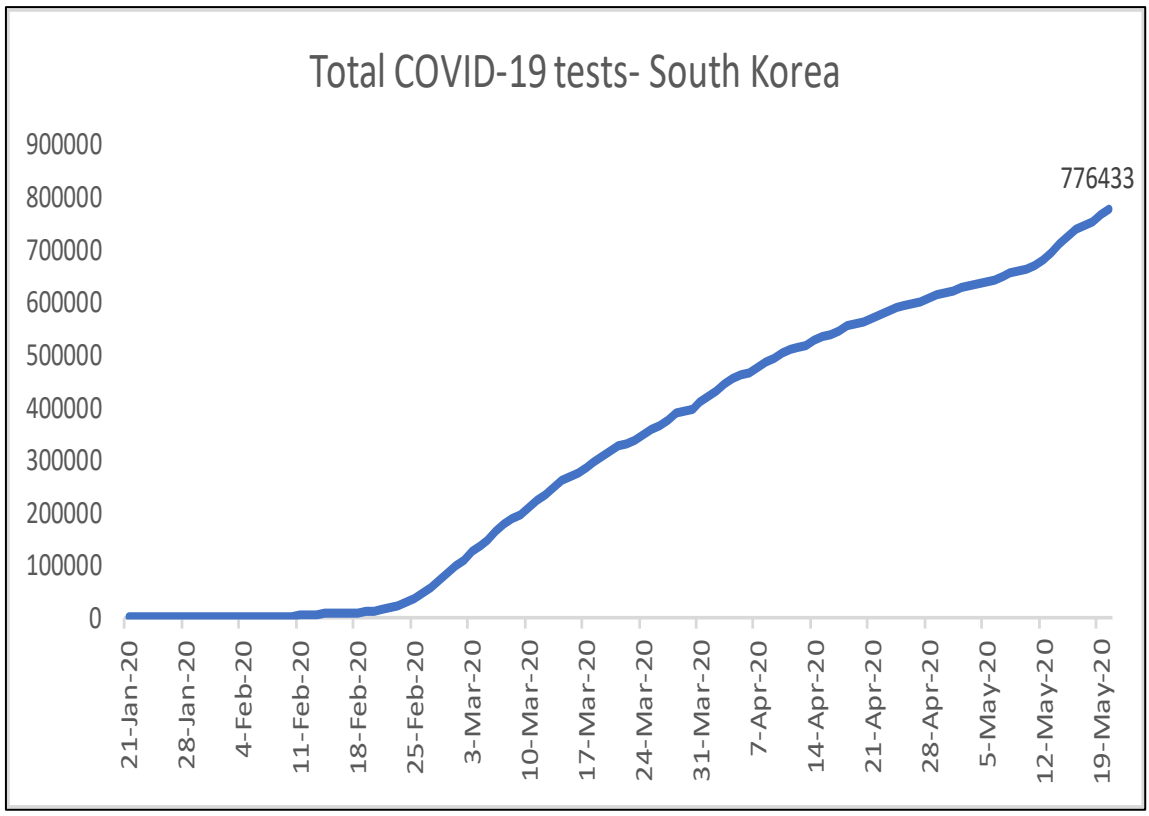

Figure 7:Graph depicts total COVID-19 tests conducted in South Korea

National Police Agency and Ministry of Health and welfare are stationed at, Ministry of Health and Welfare and Incheon International Airport's quarantine checkpoints.

For the on-site epidemic prevention and several epidemiological investigations, Incidence management system (IMS) has suggested to increase the central immediate response teams from 10 to 30.Also they will be improving the working conditions and recruitment procedure for investigation officers to fill the positions quickly.

Moreover for the smooth run of counseling session by KCDC call center, the number of counsellors has been increased along with this epidemiological inspection officers will be stationed at lower level to support local governments.

The government has re-aligned the work of frontline health workers so as they can fully concentrate on combating novel coronavirus by operating screening clinics, contact tracing etc. In order to do so they have reduced the regular health consultation and

promotion activities at primary health centers so that resources can be utilized in treatment of COVID-19.

RISK COMMUNICATION:

A self-diagnosis mobile application was designed which allow user to monitor their health condition and have access to readily available information on various follow up actions which includes physical checkups, finding clinics, using 1399 line, etc.

The KCDC advised citizens of Korea to maintain the Social Distancing and exercise good personal hygiene. The South Korean Government maintained transparency and released information about travel histories of infected patients and information related to virus.

Website named coronamap.site was designed that shows number of cases on live maps of South Korea. Various campaigns were organized to make people aware about ill effects of COVID-19 and encourage them to void large gathering.(23)

Central and local government agencies disseminate area-specific information through mobile emergency alerts, apps, and web sites, not to mention that Korea Centers for Disease Control and Prevention (KCDC) delivers daily briefings to citizens through traditional media channels.(24) Using Korea's Cell Broadcasting Service-based public warning network, government officials simultaneously send custom emergency alert messages to millions of mobile users at city and district levels.

These notifications provide status reports on the outcomes of epidemiological surveys, including specifics of recent reported outbreaks, and the time and place of the 'infection sites' visited by these patients. In collaboration with related government agencies such as the Korea Meteorological Administration, Korea's 17 local governments, mobile network providers, and cellphone manufacturing companies, the Ministry of the Interior and Safety (MOIS) administers the public warning system to ensure prompt, targeted and field-based solution.

Lessons learnt from South Korea:

- As cases of COVID-19 is increasing at alarming rate in India and opening of “open hospitals” to accumulate patients, it is necessary to -“Strengthened triage at the first point of entry at the emergency room and at the main hospital entrance for early case detection and prevention of in-hospital transmission”
- Increase no. of testing stations mainly for the high-risk population.
- Drive thru virus testing especially for migratory workers.
- Online E- Quarantine system.
- AI system for diagnosis & categorization of cases into four categories: mild, moderate, severe and very severe and each category will receive different treatment based on their needs.
- Example of AI based system used by RoK- VUNO’s Chest X-Ray AI Image Support Decision Tool – an algorithm for identifying abnormal findings on chest x-rays – classifies intensive care patients by using X-ray images and can examine the lung within just three seconds, JLK inspection etc.
- In collaboration by telecommunication industry, we can introduce GPS enabled location detection of quarantined patients in Arogya setu app.
- One of the keys to South Korea 's success is its public policies, which are basically aimed at finding as quickly as possible the most COVID-19 cases for which it relied on the work of private companies responsible for producing the test kit for thousands of Koreans.
- However, the openness of authorities with information on the spread of the virus in the country and a community that cooperates with government policies are other key elements that can serve as models for other countries.

Recommendations:

Proposed interventions & frameworks **for management of health with COVID-19**

Desk Review:

Multi- disciplinary research to understand the both human and animal diseases, the natural history of diseases. (As there are approx. 7,000 rare diseases many for which natural history is still unknown.)

Facility Level assessment:

As healthcare in India is integrated therefore before introducing any new aspect/ intervention we need to understand each stakeholder and system in detail. Surveys and in-depth interviews to identify the existing gaps in the system and how can we respond to them by new interventions such as digital technologies.

Interventions:

- Establish E- supply chain system with track and trace mechanism and pharmacies connectivity.
- Doctor chat-bots for consultation.
- AI – based diagnostic testing for diseases for faster result in hospitals.
- Support the implementation of Personal health monitoring devices should be implemented such as use of smartwatches, biosensors.
- Involvement of NGOs and organization in introducing online health and wellness program and conducting the physical therapy sessions in small groups in nearest park.
- Strengthen the surveillance system for infectious diseases.

Training & capacity Building:

- Risk communication training for traditional healers, quacks, health practioneers, frontline health worker and gram panchayat members in rural areas for infodemic management in era of COVID-19.
- As govt. has mentioned the opening of infectious diseases block in each district hospitals, there should be regular/ weekly online and in person training .

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