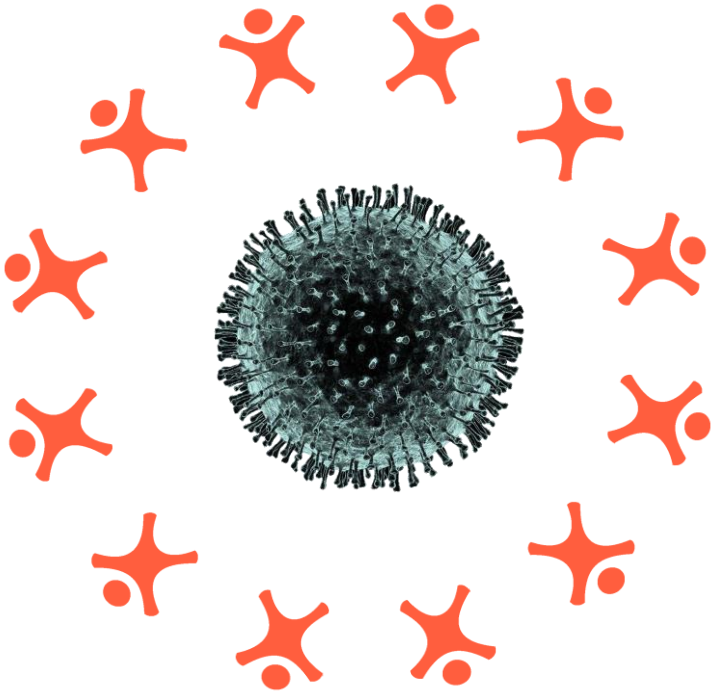
Indian Public Health Association (IPHA) and

Indian Association of Preventive and Social Medicine (IAPSM)



Joint Statement on CoVID-19 Pandemic in India:

Review of Current Strategy and the Way Forward

11th April 2020

Dr. Sanjay K. Rai
President, IPHA

Dr. Sanjay Zodpey
President IAPSM

DR. Sanghamitra Ghosh
Secretary General IPHA

Dr. A Kadri
Secretary IAPSM

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For further details please contact: Prof. (Dr.) Sanjay K. Rai, Room No. 29, Centre for Community Medicine (CCM), All India Institute of Medical Sciences (AIIMS), New Delhi-29. Phone - 011-26594416, Ph - 9868397358, email - drsanjay.aiims@gmail.com

Indian Public Health Association (IPHA)
&
Indian Association of Preventive and Social Medicine (IAPSM)

Joint COVID-19 Task Force

A Joint Task Force of eminent public health experts of India was constituted by IPHA, and IAPSM to help the Government of India for containment of COVID-19 pandemic in the country.

The terms of reference of the Joint Task Force was to 1) To review and collate the scientific epidemiological literature pertaining to COVID-19 in India at national and state level; 2) To develop consensus amongst the experts regarding COVID-19 disease epidemiology and trends and develop action plan based on the consensus; 3) To widely disseminate the consensus statement and action plan with public health experts, other medical professional associations and other key stakeholders; 4) To share the consensus statement with the policy makers at highest level at centre and state.

The members of the IPHA-IAPSM **Joint COVID-19 Task force** are as follows: (in alphabetical order)

1. Dr. A. C. Dhariwal, Former Director, NVBDCP & NCDC, and Advisor NVBDCP, MoHFW, GoI
2. Dr. Chandrakant S. Pandav, Past President IPHA & IAPSM, former Professor & Head, Centre for Community Medicine (CCM), AIIMS, New Delhi, and President, ICCIDD
3. Dr. DCS Reddy, Former Professor & Head, Community Medicine, IMS, BHU
4. Dr. Farooq Ahmed, Former Director NEIGRIMS, and Pro VC KBN University
5. Dr. Kapil Yadav, Additional Professor, CCM, AIIMS, New Delhi
6. Dr. M. K Sudarshan, Chief Editor, Indian Journal of Public Health (IJPH)
7. Dr. Puneet Misra, Past President, IAPSM & Professor, CCM, AIIMS, New Delhi
8. Dr. Rajesh Kumar, Former Professor & Head, PGIMER, Chandigarh
9. Dr. Rajib Dasgupta, Professor, Community Health, Jawaharlal Nehru University, New Delhi
10. Dr. Sanjay K. Rai, (National President, IPHA and Professor, CCM, AIIMS, New Delhi
11. Dr. Sanjay Zodpey, President, IAPSM and Vice President-Academics, Public Health Foundation of India (PHFI), New Delhi
12. Dr. Sanjiv Kumar, Former Executive Director, NHSRC and Chairman, Indian Academy of Public Health (IAPH)
13. Dr. Shashi Kant, Past President IAPSM, and Professor & Head, CCM, AIIMS, New Delhi

Executive Summary and Action Plan

The ongoing COVID-19 pandemic is a public health emergency with grave implications for whole of the world. India, as part of global community, has also been adversely impacted by the ongoing health crisis with catastrophic implications for all but the poor and the marginalized will be more affected.

The swift response of Government of India after report of the first case on 30th January, 2020 has reasonably contained rapid progress of the infection. Newer clinical, epidemiological and laboratory knowledge for control of the novel corona virus is being generated and updated every hour. However, relatively less understanding has emerged on perceptions of risk, and COVID-19 specific health inequities. The global community is collaborating and sharing information to come up with a comprehensive, effective, efficient and sustainable strategy and plan of action to control this pandemic. Open and transparent sharing of data with scientists, public health experts, and the public at large will strengthen pandemic control measures and building bottom-up consensus in India.

The unprecedented nationwide "lockdown", announced in India from 25th March 2020 for three weeks, is apparently based on the experience and epidemiological evidence of the model in some specific contexts from other countries. While achieving the expected success on account of rigorous physical distancing, the lockdown did lead to an enormous economic and livelihood crisis given the Indian realities. Most COVD-19 infected persons are without symptoms; or if at all symptomatic, the symptoms are mild and not life threatening. Majority of the patients do not require hospitalization and can be treated at domiciliary level with a modified “enforced social distancing” imposed on the household.

It is unrealistic that COVID-19 pandemic can be eliminated at this stage given that entire population is susceptible. At this point of time no vaccine or known effective treatment for the disease is available. A realistic goal would be to spread out the disease over an extended period of time and effectively plan and manage so that the healthcare delivery system is not overwhelmed. This in turn is likely to reduce mortality, especially amongst the high risk groups (elderly population, those with pre-existing co-morbidities), the most dreaded outcome of the novel corona virus infection.

Abundant scientific and evidence based interventions are available to control the pandemic at state and district levels in India. This should be adopted while at the same time minimizing the adverse effect and disruption of livelihood of the poor and marginalized.

Representing the very wide community of public health academics, practitioners and researchers in India we urge to consider seriously the following 10-point action plan for control of pandemic:

1) **Review lockdown, replace with cluster restrictions:** The ongoing nationwide lockdown needs to be reviewed and replaced with cluster specified restrictions (as required) based on epidemiological assessment; reasonable criteria and milestones for control of the current phase of the pandemic in the country should be set, taking into account that successive wave of cases is possible; there is no conceivable scenario of elimination in the immediate/short run.

2) **Source containment through** i**ncrease of public awareness and practice of preventive measures:** The most effective strategy for control of novel corona virus spread during all stages of transmission is source containment. An interdisciplinary team of public health specialists along with grass roots political and social leaderships and volunteers should continue raising awareness about COVID-19 modes of transmission and methods of prevention in the community by adopting emergency risk communication methods and broad-based community engagement strategies while acknowledging multi-cultural and multi-linguistic realities. Hand hygiene (washing with soap and water and hand sanitizers), cough etiquette, use of mask (homemade and others) should be adopted by all specially in high risk populations.

3) **Ensure physical distancing with social bonding, avoid social stigma and ensure universal mask usage:** 'Social distancing' should be replaced with 'physical distancing and enhanced social bonding' to slowdown the spread of infection while at the same time taking care of those socially isolated by lockdown through enhanced social bonding measures. Measures should be taken to avoid social stigma and fear of isolation and quarantine, by making people aware and treating them with respect and empathy. Universal mask usage by all from general public to health care providers should be ensured, with appropriate type of mask for each category of population.

4) **Sentinel and active surveillance:** Conduct extensive surveillance for Influenza like Illnesses (ILI) through ASHA/ANMs/MPWs, and Severe Acute Respiratory Illness (SARI) through clinical institutions (including private hospitals), daily reporting to identify geographic and temporal clustering of cases to trace transmission foci (hot spots / cluster events). This must be supported by trained epidemiologists from local medical colleges and public health institutions.

5) **Test, track and isolate with marked scaling up of diagnostic facilities:** Test, track contacts and carry out containment at local level by involvement of local leadership and volunteers. The use of police force should be the last resort and must be within 'reasonable limits'. Approve and scale up diagnostic facilities to increase the number of people tested with an appropriate testing algorithm.

6) **Rapid Response Teams:** Deploy mobile (well equipped with PPE) multidisciplinary Rapid Response Teams (RRTs) at district level coordinated by District Surveillance Officer (DSO) and supported by Epidemiologist and District Public Health Laboratory (with enough test kits).

7) **Strengthening Intensive care capacity:** Only those who require specialist care should be admitted in the hospital. Intensive care is only to be given by the well trained adequately protected health care providers. Appropriate support including uninterrupted oxygen supply to be ensured in all intensive care units; mild cases may be managed at home.

8) **Optimal PPE for frontline workers:** Nosocomial infection of COVD-19 is a serious challenge affecting safety and morale of health care providers (HCP). This is also important mode of infection transmission amplification and acceleration once HCP become "super-spreaders". Appropriate PPE must be provided to HCP to instill confidence and alternate teams identified to take care of attrition due to fatigue, exposure and quarantine.

9) **Free sharing of data in public domain and Public Health Commission:** All data including test results should be made available in public domain (unlinked anonymous) for the research community (clinical, laboratory, public health and social sciences) to access, analyse and provide real-time context-specific solutions to control the pandemic. A Public Health Commission with task-specific Working Groups may be urgently constituted to provide real-time technical inputs to the government.

10) **Increase health expenditure to 5% of GDP, focus on public health system strengthening** - Strategies will need to be dynamic to shift gears if widespread community transmission is detected. Hospital teams will then need to play an enhanced role for the care of the sick, and safe disposal of the bodies of unfortunate ones. Local health authorities, municipal bodies and panchayats should be sensitized to enable policy makers and planners not to be instrumental in creating a "pandemic of human misery" by advocating impromptu public health decisions not supported by epidemiological data and evidence based scientific reasoning. Rapid scaling up (five times) of public health, clinical and related social care -- both services and research -- should be done on a war footing with an allocation of about 5% of GDP.

We sign out on a positive note. Evidence based scientific and humanistic policies will help us in overcoming this calamity with minimal loss to human life, social structures and economies. Nature has once again reminded us of our tenuous situation in the wider universe. It is high time that humankind takes note of the warning signals and undertakes midcourse corrections urgently and now. The "One World One Health" approach should be central in ensuring optimal harmony amongst all humans and animals of the world based on principle of "*Vasudhaiva Kutumbakam"* (The world is one family). Being respectful and mindful of all animate and inanimate beings of this planet is the way forward in the post-COVID-19 world.

1). Epidemiology of COVID 19

Introduction: Coronavirus disease 2019 (COVID-19) is a respiratory tract infection caused by a newly emergent coronavirus called Severe Acute Respiratory Syndrome Corona Virus-2 (SARS-CoV-2) that was first recognized in Wuhan, China, in December 2019. Genetic sequencing of the SARS-CoV-2 suggests that it is a beta coronavirus closely linked to the SARS virus.[1] Epidemiological investigations have suggested that the outbreak was associated with a seafood market in Wuhan, China.[2]

Since December of 2019 and up to April 10, 2020, over 1,600,000 cases of SARS-CoV-2 infection, with over 99,000 deaths have been reported in more than 200 countries. The pandemic is accelerating at an exponential rate. The first 100 thousand cases took 67 days. The second 100 thousand took 11 days; the third 100 thousand took just 4 days and the fourth 100 thousand just 2 days. Now more than 50 thousand cased are added every day. The epidemic picture is changing on a daily basis.

The World Health Organization (WHO) issued a travel advisory on international travel on 27thJanuary, 2020. It declared the outbreak a public health emergency of international concern on 30th January, 2020. On 11th March 2020, WHO declared COVID-19 as a pandemic.

Indian Scenario: In India, the SARS-CoV-2 is not indigenous. It is an "Immigrant Virus". It has entered the Indian Territory along with the travelers coming from countries where transmission was ongoing. The countries from which the immigrants entered India (domestic/foreign) are China, Iran, Arab countries, Italy, and other European countries, North America, Indonesia, South Korea and Japan. India reported first case on 30th January, second case on 2nd February, and third case on 3rd February 2020. All the three cases were reported from Kerala and had travel history to Wuhan.

Table-1: Number of cases and deaths due to COVID-19 in Different States of India as on April 10, 2020

States	Total Number of COVID-19 Cases	Total No of Deaths
Maharashtra	1364	97
Delhi	898	13
Tamil Nadu	834	8
Telangana	473	7
Rajasthan	463	3
Uttar Pradesh	431	4
Andhra Pradesh	363	6
Kerala	357	2
Madhya Pradesh	259	16
Gujrat	241	17
Karnataka	197	6
Jammu & Kashmir	184	4
Haryana	169	3
Punjab	132	11
West Bengal	116	5
All other States	280	4
Total	6761	206

Till 1st March, 2020 India did not report any new cases. However, from 2nd March, 2020 onwards COVID-19 cases were reported from all States in India. As on 10th April, 2020 a total of 6,761 cases and 206 deaths have been reported. Out of 37 States, and Union Territories, 31 have reported cases of COVID-19. States like Maharashtra (1,364), Tamil Nadu (834), Delhi (898), Telangana (473), Kerala (357), Rajasthan (463), Uttar Pradesh (431), Andhra Pradesh (363), Madhya Pradesh (259) and Gujarat (241) reported 200+ cases. Remaining states reported less than 200 cases each (Table-1).

Agent Factors:

- **Agent:** The agent of COVID-19 is a single-stranded RNA virus of genus beta coronavirus called SARS-CoV-2.This is the seventh coronavirus known to infect humans. Initially this virus strain was designated as WH-Human 1 coronavirus (WHCV).[2]
- **Origin of the Virus:** The origin of the virus is not fully understood. However, studies have indicated that COVID-19 is a zoonotic virus. From phylogenetics analyses undertaken with available full genome sequences, bats appear to be the reservoir of COVID-19 virus, but the intermediate host(s) has not yet been identified.[3]Outside of bats, pangolins are the only mammals reported to date, that have been found to be infected with a coronavirus related to SARS-Cov-2. The researchers have said their findings highlight a potentially important role of pangolin could be considered as possible hosts in the emergence of SARS-CoV-2 virus.
- **Source of Infection:** Usually a case, or subclinical and asymptomatic case.
- **Period of infectivity:** Not clearly known. Few studies have observed median duration of viral RNA detection was 20.0 days (IQR17.0–24.0) in survivors. However, SARS-CoV-2 virus was detectable until death in non-survivors. The longest observed duration of viral shedding in survivors was 37days.[4]

Host Factors:

- **Age and Sex:** COVID-19 affects all ages and both sexes. But data on individuals aged 18 years or less suggest that there is a relatively low attack rate in this age group (2.4% of all reported cases in China). In the absence of results from serologic studies, it is not possible to determine the extent of infection among children, what role children play in transmission, whether children are less susceptible or if they present differently clinically (i.e. generally milder presentations)? Older age and co-morbid disease have been reported as risk factors for death, and recent multivariable analysis confirmed older age, higher Sequential Organ Failure Assessment (SOFA) score and d-dimer > 1 μg/L on admission were associated with higher mortality.[4]
- **Close contact and human mobility:** Close contact and human mobility is an important factor in the spread of infection.
- **Susceptibility:** As SARS-CoV-2 is a newly identified pathogen, there is no known pre-existing immunity in humans. Based on the epidemiologic characteristics observed so far in China,

everyone is assumed to be susceptible, although there may be risk factors increasing susceptibility to infection.

- **Immunity:** (It has already been mentioned in earlier section). The antibody response in infected patient remains largely unknown. The clinical value of antibody testing has not been fully demonstrated. In a study the seroconversion rate for Ab, IgM and IgG was 93.1% (161/173), 82.7% (143/173) and 64.7% (112/173), respectively. The seroconversion sequentially appeared for Ab, IgM and then IgG, with a median time of 11, 12 and 14 days, respectively.[5]

The figures 1 and 2 show the humoral response from 208 samples tested in Wuhan and Beijing hospitals. The findings were as follows:

Fig 1: Time of appearance of IgM, IgA, and IgG antibodies to SARS-CoV-2, determined by ELISA of plasma samples obtained from 208 in-patients with SARS-CoV-2 infection.[6]

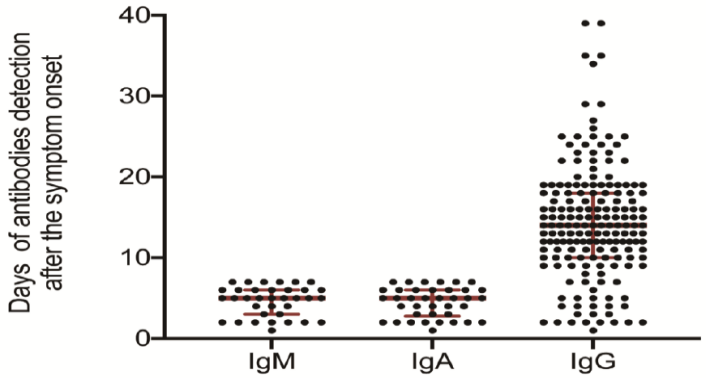
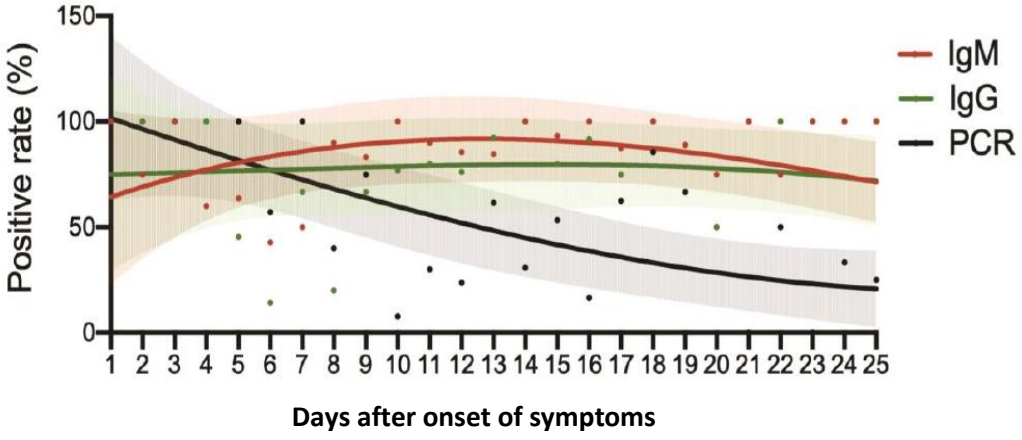


Fig 2: Fitted curve of the positive detection by PCR, IgM or IgG ELISA on different days after symptom onset.[6] (I think this again is reference number. If so, please make it in Arabic numeral)



Environmental Factors:

- Season: Seasonal effect is not well documented. But meteorological parameters are the important factors influencing the infectious diseases such as severe acute respiratory syndrome (SARS) and influenza. Few studies reported that the COVID-19 was related to the meteorological factors, which decreased with the increase in the temperature.

  Warm and dry weather conditions result in increase in atmospheric suspended matter, providing conditions for virus adhesion, breeding and transmission. Analysis of samples collected from patients reporting to hospital in Stockholm county from 2010 to 2019 showed the coronavirus positivity rate was 2% for winter months and 0.2% for summer months. This could be a reasonable proxy of higher prevalence of diseases caused by coronavirus in winter months.[7]

  Diurnal temperature range (DTR) and humidity on the daily mortality of COVID-19 in Chinese population shows that the daily mortality of COVID-19 is positively associated with DTR but negatively with absolute humidity. In summary, this study suggests the temperature variation and humidity may also be important factors affecting the COVID-19 mortality.[8]Other studies from China found that the optimum temperature for virus transmission was 10^0C. Lower or higher temperatures suppress the transmission.[9]One study concluded that temperature ranging 13^0C~190C (it should be 19 degree rather than 190C) and humidity in 50% ~ 80% are suitable for the survival and transmission of the new coronavirus.[10]

- Mode of transmission: Major modes of transmission are droplet and fomite. SARS-CoV-2 is transmitted via droplets and fomites during close unprotected contact between an infector and infectee. Airborne spread has not been reported for COVID-19. It is not believed to be a major driver of transmission based on available evidence. However, it can be envisaged if certain aerosol-generating procedures are conducted in health care facilities. Fecal shedding has been demonstrated from some patients, and viable virus has been identified in a limited number of case reports. Thus, the fecal-oral route does not appear to be a driver of COVID-19 transmission. Its role and significance for COVID-19 remains to be determined.[11]

  Few studies have documented that the SARS-CoV-2 virus was detectable in aerosol for up to 3 hours, up to 4 hours on copper, up to 24 hours on cardboard, and up to 3 days on plastic and steel surface. Secondary attack rate among household contact was found to be 3-10% (R0 of 2-2.5).[12]

Incubation period: Incubation period varies between 2 days to 2 weeks. However, majority of the COVID-19 patients have an incubation period of 3 to 7 days with the mean duration of incubation period of 5.2 days (95% CI, 4.1 to 7.0). Based on studies from China, the basic reproduction number (R0) is estimated to be approximately 2.2 (95% CI, 1.4 to 3.9), i.e. on average each patient can infect 2.2 other people.[13]

Case Definitions[14]

Suspect case

- A patient with acute respiratory illness (fever and at least one sign/symptom of respiratory disease (e.g., cough, shortness of breath), AND with no other etiology that fully explains the clinical presentation AND a history of travel to or residence in a country/area or territory reporting local transmission of COVID-19 disease during the 14 days prior to symptom onset;

OR

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

OR

A patient with severe acute respiratory infection (fever and at least one sign/symptom of respiratory disease (e.g., cough, shortness breath) AND requiring hospitalization AND with no other etiology that fully explains the clinical presentation.

Probable case

A. A suspect case for whom testing for the COVID-19 virus is inconclusive.

OR

B. A suspect case for whom 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.

Clinical Features: Symptoms are nonspecific and disease presentation can range from no symptom to severe pneumonia and death. Fever, cough and fatigue are the most common symptoms. Studies have documented fever (87.9%), dry cough (67.7%), fatigue (38.1%), sputum production (33.4%), shortness of breath (18.6%), sore throat (13.9%), headache (13.6%), myalgia or arthralgia (14.8%), chills (11.4%), nausea or vomiting (5.0%), nasal congestion (4.8%), diarrhea (3.7%), and hemoptysis (0.9%), and conjunctival congestion (0.8%).[3]

Most people with COVID-19 develop only mild or uncomplicated illness (81%). Approximately 14% develop severe disease that requires hospitalization and oxygen support, and 5% require admission to an intensive care unit. In severe cases, COVID-19 can be complicated by the acute respiratory distress syndrome (ARDS), sepsis and septic shock, multi organ failure, including acute kidney injury and cardiac injury.

Radiological features: Chest Computed Tomography features of COVID-19 patients were characterized by the ground-glass opacity and bilateral patchy shadowing.[15]

Diagnostic Test: Real-time RTPCR (rRT-PCR) on samples from nasopharyngeal swab or broncho-alveolar lavage (BAL) fluid.

Treatment: There is no specific treatment for COVID-19. No pharmaceutical products have yet been shown to be safe and effective for the treatment of COVID-19. However, a number of medicines have been suggested as potential investigational therapies,

In many countries, doctors are giving COVID-19 patients medicines that have not been approved for this disease which includes Hydroxychloroquine (HCQ), Azithromycin, and few antiretroviral drugs.

II) Strategies for control of Covid19 outbreak and recommendations-

Available interventions for control of COVID 19 outbreak and the current strategy for the same being implemented in India are discussed in brief below. The known interventions are categorised as individual level, community level and overarching interventions (though there may be some overlap in case of some interventions) and the current best available evidence and implication of interventions for each of the intervention is discussed in brief.

a) Individual level interventions-

- *Hand hygiene*- Frequent hand washing is highly effective in reducing human to human transmission for respiratory virus spread by predominantly fomite/droplets on surfaces. Also effective for droplet borne infections up to certain extent. Alcohol based sanitizers and soap and water may be equally effective. [16]

  In 2015, there were an estimated 150 million people without access to 'at least basic' water with a greater share in rural areas than urban.[17] The National Sample Survey (NSS) 76th round 2019 reported that 25.3 per cent rural households and 56 per cent urban households washed hands with soap or detergent before a meal.[18] Behaviour change interventions have been demonstrated in India to lead to significant increase over baseline rates but require sustained inputs, up to a year. [19] Community engagement (CE) strategies are participatory processes that enable equitable partnerships developed with community stakeholders who are enabled to identify, develop and implement community-led sustainable solutions; these lead to better outcomes than conventional BCC or IEC campaigns.[20]

  Recommendation: Novel decentralised strategies are required to ramp up supply of both water (through municipal and panchayat systems) and soap (through the PDS) and complement with context sensitive community engagement strategies.

- *Cough etiquette including universal mask usage*- Emerging as one of the key interventions for control, primarily by providing inward and outward protection against droplet borne infections and also aerosol borne infections. Mask usage (surgical and N95) from initial recommendations for use by only HCWs and those symptomatic, is being gradually expanded to general populations with a requirement of assured supplies for all. [21,22]

  Evidence and policy on masks is rapidly unfolding with WHO, other national agencies and scholars having differing positions. 'Mass mask panic' and panic buying occurred irrespective of advice from

public health authorities. [23] India modified its mask policy on 4th April 4 2020 based on assessment of the epidemiological risks by the health authorities. India now advises handmade reusable face cover for those not suffering from medical conditions or having breathing difficulties to protect the community at large.

Recommendation: This entails both ramping up the production of simple masks making it available throughout the country and wide ranging campaign on how to prepare simple handmade masks. Given the large numbers of widespread vulnerable population, the local health authorities have an enormous task of making simple masks universally available and accessible.

- *Quarantine and isolation of exposed and suspected/symptomatic cases:* the chain of transmission can be significantly slowed and may be even broken if all those who are exposed can be quarantined (for at least 14 days) and those who are symptomatic (flu like symptoms) can be isolated. It may be difficult to implement and the presence of asymptomatic/early prodrome in case of COVID has put question mark on this intervention strategy.

  Stochastic transmission modelling, parameterised to the COVID-19 outbreak scenarios, indicates that highly effective contact tracing and case isolation may control a new outbreak of COVID-19 within 3 months. The probability of control decreases with long delays from symptom onset to isolation, fewer cases ascertained by contact tracing, and increasing transmission before symptoms.[24] Economists are weighing subtle interactions between health and the economic consequences of prolonged lockdowns. Current models are simplistic and efforts are on to create more sophisticated scenarios that include the size of different age groups in a population to account for differences in how deadly the disease is for different ages, and modified 'smart' lockdowns that allow more economic activity.[25]

  Recommendation: Urgent research incorporating Indian data and scenarios need to construct models for the country and design effective social protection schemes to adequately cushion the shocks of the ongoing lockdown that may potentially need to be extended at least in certain states/districts.

- *Isolation of high risk individuals:* elderly (>70years,), those with co-morbidities (CKD, diabetes, underlying lung diseases) - considering the overwhelming majority of death being reported amongst these groups, this may be highly effective in reducing the total deaths. India may be in a better position to implement this because of low proportion of elderly and also the fact that even this lower percentage of elderly in India is relatively less mobile and not engaged in economic activities (unlike western populations), so may be easier to isolate them, at least during the peak of the outbreak.

Analysis of Census 2011 indicates that there are almost 15 million households comprising only of single elderly Indians, nearly three-fourths of them women. Such households are in higher proportion in post-demographic southern states. An estimated 15% elderly persons live in households where there is nobody below the age of 60.[26] India also has more than 1.7 million homeless persons, a little more than half of them in urban areas.[27]

Recommendation: These population groups represent additional vulnerabilities that social protection schemes should urgently cater to while ensuring isolation.

- Pharmaceutical intervention - prophylaxis with Hydroxychloroquine (HCQ), Azithromycin, and anti-virals - anecdotal evidence of questionable benefit. Needs to be further verified with controlled trials before they can be recommended.

  The National Taskforce for COVID-19 has recommended the use of hydroxychloroquine (HCQ) for chemoprophylaxis of SARS-CoV-2 infection for the following categories: (i) asymptomatic healthcare workers involved in the care of suspected or confirmed cases of COVID-19 and ((ii) asymptomatic household contacts of laboratory confirmed cases. It has also urged continued research on proof of concept. Different scientific research organisations have called for proposals on these and related aspects and are being fast tracked for funding.

  Recommendation: A dynamic policy shall guide the relevance and application of the emerging evidence for public health operations.

- *Role of vaccine in future* - Vaccine has limited role in controlling ongoing outbreaks. Development of effective vaccine may prevent future outbreaks, or may be useful in protecting those at high risk. Considering a few candidate antigens have been identified, and that SARS-COV2 is relatively more stable than seasonal influenza virus, theoretically vaccine may be a useful intervention in future. But currently or in near future it has no role.

  Recommendation: As vaccine trials and production becomes a real possibility India needs to work towards technology transfer and local production. India's vaccine industry is technologically robust but will require suitable fiscal support and incentives.

b) Community Interventions

- *Social distancing:*-has been identified as important intervention specially form droplet borne infection in the radius of 1-2 meters. However, it is seemingly not possible for majority of the population in India and also difficult to practice for a sustained period. It has a definite role in controlling the spread in institutional settings like schools, colleges and religious congregations.

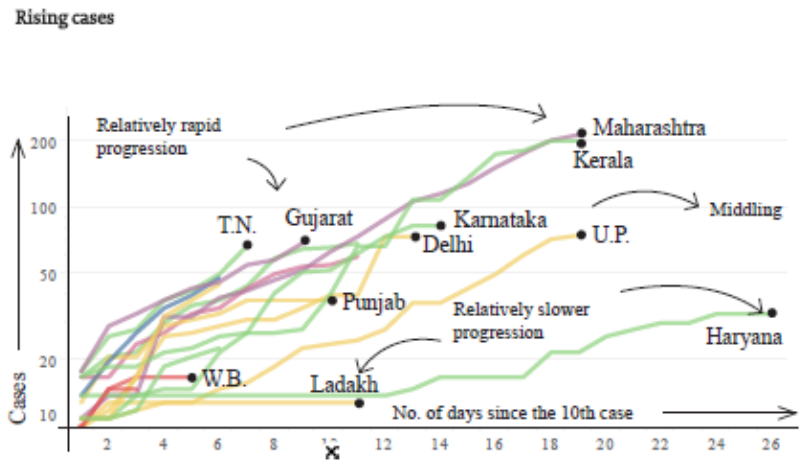
  Physical distancing is possible only for the better off: not so for the nearly 4% homeless and 40% households of India living in one-room houses (Census 2011), or for the majority who cannot stay off work, in a country where over 90% are dependent on the informal sector for livelihoods.[28]

  Recommendation: Social distancing may be more appropriately replaced with physical distancing and social bonding

- *Test, Trace and Isolate:* early detection and contact reduction is a well established epidemiologic intervention. However, availability of test kits and health system capacity to undertake this on scale limits its use. May be of use in defined geographies or once the supply chain of kits as well as health system strengthening is achieved.

  India has one of the lowest testing rates in the world currently but with differences across the States. India is also initiating serological testing that will add to a nuanced understanding.

  Recommendation: Both diagnostic and serological testing may require significant acceleration, with specific state/district policies in sync with the prevailing epidemiological scenario.



Source: The Hindu

- *Focus on hot spots and its containment:* due to droplet infections being the predominant transmission route supplemented by fomite and airborne transmission, super spreaders and clusters outbreaks are the

early hall marks of spread of infection into the community. If with adequate surveillance, these clusters/hot spots can be identified early enough and containment measures instituted, the spread of infection in general population may be delayed or even disrupted.

India has been successfully tracking and tracing contacts of cluster events. Different states have experimented with operational procedures and technologies to sustain these as numbers are increasing.

Recommendation: Learning across states especially from those with high incidence (Kerala, Maharashtra) and highly dense populated pockets (Dharavi, Bhivandi slums of Mumbai; Maujpur, Seelampur etc of Delhi; Ramganj Bazar area of Jaipur etc) will enable other states to set up and modify existing systems.

- *Social Behaviour Change Communication (SBCC):* is the bedrock of most of the interventions for respiratory virus infection transmission. It should be the key intervention for any strategy adopted whether suppression or mitigation.

  Risk Communication and Community Engagement (RCCE): is an essential component of the preparedness and response action plan.[29] India has framed some action points and states are implementing it, with local adaptations.

  Recommendation: Decentralised and socially and culturally appropriate risk communication and community preparedness plans need to be operationalized urgently.

- *Protection offered by BCG, malaria infection and other infections:-* some ecological studies available, but evidence needs to further critically reviewed before the same can be adopted as interventions.

- *Travel restriction* - International and within country restrictions: though travel restrictions have not been shown to be very effective against respiratory virus, however this does delay the epidemic curve significantly. This delay provides ample time to health system to prepare for the eventual outbreak.

- *Optimal PPE for Health Care Providers:* critical for protection of health care worker and also for stopping the spread of infection from HCW to general public and thus prevent health system becoming a

super spreader of infection. Stringent PPE which can protect against aerosol transmission of infection is warranted for all health care workers directly dealing with COVID positive and high suspicion cases.

Several media reports have emerged highlighting shortages of PPE at least in select institutions and several health care workers have tested positive in the last few days. Germany's decentralised federal system is considered to have experienced relatively greater success in both testing and stockpiling PPE.[30]

Recommendation: India is now entering the phase where significant load of clinical cases can be expected. There is a narrow window of opportunity for institutions to stockpile PPE. The states/districts may consider stockpiling using decentralised mechanisms particularly supported by the respective State Medical Supplies Corporations and/or State Health Resource Centres.

- *Lock down or shut down:* last resort for control of epidemic when all else fails, or we do not have capacity to implement other interventions. It does slow the epidemic curve, however cannot be implemented in perpetuity and may have serious overall deleterious effect not related to COVID19.

c) Overarching interventions

- *Health system strengthening including capacity enhancement for intensive care:* considering that a significant proportion of those infected will develop severe disease (5-15%) and some may require intensive care (1-5%), health system strengthening is important. Robust health system helps to avoid panic and also keeps overall mortality low.
- *Enhanced R &D* - for newer drugs, vaccines and basic research to understand the epidemiology and also other operational research is required.

Comparison of COVID-19 control measures across select countries - China, Japan, South Korea, USA, France, India, Italy, Spain, UK and Iran

The weekly progress of COVID cases across various countries has shown differential trends and may have been because of epidemiological differences, demograhic characteristics and effect of control measures adopted by each of the countries.

Table 2: Weekly progression of COVID-19 cases in few selected countries

Weeks	China	Japan	South Korea	USA	France	India	Italy	Spain	UK	Iran
1st Week	1 *(Dec 31, 19)	1 *(Jan 15, 20)	2 *(Jan 20, 20)	5 *(Jan 23, 20)	5 *(Jan 24, 20)	3 *(Jan 30, 20)	2 *(Jan 31, 20)	1 *(Jan 31, 20)	2 *(Jan 31, 20)	61 *(Feb 19, 20)
2nd Week		6	15	11	6	3	3	2	9	1501
3rd Week	278	20	27	13	11	3	3	2	9	7161
4th Week	2761	26	29	15	12	3	400	12	13	14911
5th Week	17238	65	602	53	18	6	3089	198	89	23049
6th Week	40235	157	3736	108	282	60	12462	2140	460	41495
7th Week	70635	268	7134	696	2269	137	35713	13716	2630	60500 #(Apr, 07)
8th Week	77262	514	8162	3536	9043	562	74386	47610	9533	
9th Week	80174	829	8897	51914	24920	1636	110574	102136	29478 #(Apr, 02)	
10th Week	80904	1128	9583	163199	56261	5194 #(Apr, 08)	139422 #(Apr, 09)	146690 #(Apr, 09)	60739 #(Apr, 09)	
11th Week	81077	1953	10237 #(Apr, 05)	363321 #(Apr, 08)	77226 #(Apr, 08)					
12th Week	81601	3906 #(Apr, 7)								
13th Week	82447									
14th Week	83005 #(Apr, 06)									

Source: WHO situation report available from https://www.who.int/emergencies/diseases/novel-coronavirus-2019/situation-reports

Note: *the date in the first week columns signifies the date of first case reported to WHO in each country

 # the date with last figure in columns signifies the date of end of last week identified in each country

"*When a novel influenza A virus with pandemic potential emerges, non-pharmaceutical interventions (NPIs) often are the most readily available interventions to help slow transmission of the virus in communities, which is especially important before a pandemic vaccine becomes widely available. NPIs,*

also known as community mitigation measures, are actions that persons and communities can take to help slow the spread of respiratory virus infections. NPIs can be phased in, or layered, on the basis of pandemic severity and local transmission patterns over time."

Conventional public health measures like strict vigilance to prevent entry of infected persons from a known infected country, contact tracing of cases followed by isolation of cases, strict quarantining of the contacts are the major public health interventions. For diseases which do not have any specific preventive or treatment options (vaccination, chemoprophylaxis or drugs) NPI is the intervention of choice. It is also known as "Community mitigation measures. "Enforcement of Strict Isolation of Cases" (ESIC) was one of the major measures which was used in the small pox eradication program of India. ESIC was first used in the control of small pox in Africa. WHO epidemiologist Dr. Brilliant, Dr. MID Sharma, and Dr. RN Basu introduced it in India after proper modification as per its need.. The objective of the current "Social Distancing" is to decrease the spread of person to person transmission and has been extensively used in Africa to control diseases like "Ebola" specially in the form of partial or total lock down of the affected village area, region. The term "Lock down" is nothing but enforced social isolation from the health community. In the beginning of this pandemic China was the first country to use complete lock down of one region and thereafter a province. For successful implementation, massive deployment of security personnel was made. By this method China was able to control the spread within a reasonable time period. Whether this dramatic decrease of transmission in such a short period was due to lock down alone or the natural process ebbing of the epidemic played a major role is not clear. The short and long time impact of lock down on the social and economic status of the population can only be speculated.

The report of the WHO- China Joint Mission on Corona Virus 2019 (16-24 February) (8) endorses " the efficacy and effectiveness of anchoring COVID19 readiness and response plan in a thorough assessment of local risks and of utilizing a differentiated risk- based containment strategy to manage a outbreak in areas with no cases vs. clusters of cases vs. community level transmission." The measures are extremely proactive surveillance to immediately detect cases, vary rapid diagnosis and immediate case isolation, rigorous tracking and quarantine of close contacts, and an exceptional high degree of population understanding and acceptance of the measure" Each of these sentence has implication in deciding a public health policy.

On March 13, Time magazine said: "The U.S. has enormous capacity," says Wang, the Stanford professor. But he notes that it "needs to mount a coordinated effort, like Taiwan, because the infection impacts many aspects of society and really affects people's lives." David Hui, in Hong Kong, says it's vital that the U.S. starts limiting social contacts to avoid a large-scale outbreak with the potential to

overwhelm the health system. Schools need to be closed and mass gatherings cancelled—something that is just now beginning to happen. But US didn't follow the advices and now results are there for everyone to see. They learned the lessons hard way and now imposing various measures. President Trump realised the grave situation only this week and admitted on TV about this issue saying that 100,000 to 2000, 000 deaths may be there and imposed restriction up to 30th April. NY Governor Cuomo has ordered all peripheral hospitals to send ventilators to NYC hospitals to take of situation, but all these things are probably happening because of ignoring previous warnings and advisories by various researchers. Though CDC was issuing various advisories and resource material but political leadership there was not willing to listen. As opposed to USA, In India political leadership was very active and have listened to public health professionals and controlled the situation up to certain extent.

CDC in its preparation issued various guidelines for health care workers, old people, school kids, along with guidelines for running businesses in current circumstances. USA has restricted movement and lock downs in certain areas to stop the spread. They have changed guidelines for everyone to use the mask even cloth masks. Also steps were taken to prepare community and faith base leaders, stop rumours, personal protection, home isolation, care of homeless people, supply of respirators, ventilators and hospital preparedness in various states according to their needs and many other guidelines by CDC [31]

On 1st February, 2020, Taiwan, Hong Kong, and Singapore had all proactively implemented travel restrictions on passengers coming from the mainland China, contravening the World Health Organization's (WHO) insistence that travel bans were not necessary. Though these precautions came at a significant economic cost as their biggest trading partner and source of tourists was china. These countries also implemented rigorous detection and strict quarantine. [32]

Singapore was one of the first countries to impose restrictions on anyone with recent travel history to China and parts of South Korea. It has a strict hospital and home quarantine regimen for potentially infected patients and is extensively tracing anyone who may have been in contact with a case. https://www.weforum.org/agenda/2020/03/singapore-response-contained-coronavirus-covid19-outbreak/

India's current strategy:-from initial international quarantine to social distancing to nationwide lock down to now increasing testing and focus on cluster identification, the strategy in India is fluid and dynamic and is being further changed in real time. Different states have their own level of preparedness and strategy.

Public health interventions to combat the onslaught of the spread of a pandemic should be based on the basis of the country specific epidemiological need compatible with the health policy, health care delivery system and other governance.

Before the declaration of the pandemic by WHO, Government of India's policy of immigration control from the most infected country prevented the seeding of the CVD 19 infections in India. Concurrent implementation of Screening, Isolation, Quarantining of infected and suspect cases as well as other surveillance and containment measures introduced by the Ministry of Health & FW Government of India was another important step which impacted the rate of spread in the different states. Unlike other countries, In India, strict surveillance measures specially contact tracing using android technology and use of "Enforced Social Distancing" in the form of partial and or total lock down of some districts, whole state and lastly the whole country has resulted in curtailing the speed of the pandemic.

Since inception of public health, a complete lock down of a nation is the boldest step in the history of public health intervention, for preventing an emerging pandemic, to save the people from the clutches of an impending pestilence. This bold step must have been taken on the basis of a factual epidemiological data and sound tenets of public health practice provided by the National health experts of the country and research organization like ICMR. However, the critics' remark on the impact of the enforced social distancing on the population as well as nations' economy is understandable. But for the greater interest of the people some drastic action has to be taken in public health. During the evolution of the epidemic in India the salient features related to the epidemiological, clinical, health care seeking behaviour data of the people of different states needs to be studied for supporting the current strategy and its impact.

All three (individual, community and overarching) interventions may be implemented in integrated manner to achieve slowing of infection spread and minimize the severe cases and mortality amongst those at higher risk and also prevent the surge of cases and consequent stress on health system and health care providers. Lessons may be derived from success stories in COVID 19 control across the globe and also from not so successful efforts.

III) The Way forward -

The current covid19 pandemic has been playing out in manner of heightened stress for both the general population and health care system. The ongoing "lock down" announced till 14th April,2020 cannot go on in perpetuity and will have to reviewed and appropriate modifications be made at national, state and may be district and sub-district level also. The proposed strategy and interventions at national and state level may be broadly divided into immediate, short term, medium term and long term as follows:

a) Immediate:

- Geo spatial distribution of cases, active and old, at the district level should be considered for prioritizing specific public health action.
- The natural history of COVD 19 in India till date is based on the observation of 1200 odd cases (subject to authentication from existing data). Most of the COVID 19 infected person are symptomless. If at all symptomatic the symptoms are mild and not life threatening and majority of the lot do not require hospitalization or even graduate medical care and can be treated at domiciliary level with a modified "Enforced Social distancing" imposed on the household. This will serve three purposes: isolation of a case and its treatment and monitoring for complication and quarantining the household contacts.
- Those who require specialist care should only be admitted in the hospital. This will free up the beds and reduce the work load of the treating hospital. The chances of infection among the health care providers will also be less.
- Intensive care is only to be given by the well trained well protected health care provider.
- All hospitals, public or private, should start a fever clinic. Each of the patients attending a hospital should be screened by recording temperature and any with fever should be sent to "Fever Clinic" manned by well protected staff for further clinical work out. This will act as the "Sentinel" surveillance" post.
- To prevent nosocomial Infection of COVID 19 (which is the most prevalent type in western countries and even in china), the above steps are necessary.

b) Short term

- Inputs on a) Decision making set up of Govt, and others b) Managing medical countermeasures c) Travel and trade activity advisories d) Research and development of vaccines, therapeutics and diagnostics etc e) Risk communication to public
- Health services can play a great role in containing the epidemic by:
- Creating of awareness about modes of transmission and methods of prevention of Covid-19 which helps in reduction of stigma and removal of fear of isolation and quarantine through health workers and by sensitizing the community leaders,
- Conducting surveillance for ILI through ASHA/ANM/MPW and SARI through health centres and hospitals
- Testing, contact tracing and ensuring containment by involving local volunteers
- Daily reporting of cases which helps in identifying geographic and temporal clustering of cases
- And putting in place well equipped rapid response teams (RRT) coordinated by DSO and supported by an epidemiologist and public health laboratory
- Appropriate PPE must be provided to HCWs to instill confidence in them and an alternate team should be identified to take care of attrition of HCW due to exposure & quarantine.
- Approve and scale up diagnostic facilities to increase the number of people tested. Procure sufficient equipment and goods to handle the case load
- There is time for preparation so as to face boldly the impending crisis with sensitivity without extending forced curfew covering entire country putting large section of people in distress.
- Maintain strict surveillance of suspect cases and their contacts

c) Medium term:

- Health policy maker and planners should be cautious not to be instrumental in creating a "Pandemic of human misery" by advocating impromptu Community Medicine (Public health) decision, not supported by epidemiological data and evidence based scientific reasoning. Such action will be an antithesis of the philosophy of "Community Medicine" especially tenets of the first level of prevention i.e. Promotion of health & protecting the community from disease and disability.

- Strategy will need to be changed if wide spread community transmission without transmission foci is detected. Then hospital teams will play major role for care of sick and safe disposal of the bodies of unlucky ones (Municipality and Panchayats should be sensitized about it).
- Engage medical/ nursing colleges in all pandemic control activities at district and state level.

d) Long term measures:

- A large scale expansion (5 times) of public health service & medical service should be done immediately on war footing with allocation of about 5% of GDP.
- Increase the capacity at the state and district levels to respond to the current pandemic and also similar public health emergencies in future.

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