Commentary

The current situation of COVID-19 in India

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A B S T R A C T

The COVID-19 pandemic has now risen to a global health crisis across the globe. This novel virus outbreak has challenged India’s economic, medical and public health infrastructure. Health care professionals and researchers around the world are looking for an effective treatment regime for COVID-19. The number of people infected by COVID-19 in India crossed 9.74 million; nearly eleven - months after the country reported its first case. The Ministry of Health and Family Welfare of India (MOHFW) has taken numerous measures to raise awareness on COVID-19 and the necessary actions to control the spread of the virus. The central and state governments are formulating several wartime protocols to achieve this goal. The MOHFW has implemented the new clinical management protocol to treat COVID-19. Besides, the Ministry of AYUSH has also provided guidelines to use conventional preventive and treatment strategies to enhance immunity. The national recovery rate has increased to 94.66% and the reported fatality rate is down to 1.45, due to “test, track and treat”. MOHFW and Ministry of AYUSH are the two pillars of health care to prevent and manage the current pandemic outbreak in India. Since, there is no specific drug or vaccine effective against COVID-19 infection, exploring every possible option for prevention and treatment is of great importance.

1. Introduction

COVID-19, caused by severe acute respiratory syndrome coronavirus 2 (SARS-CoV-2) first emerged in late 2019 in Wuhan, China and the number of cases rose quickly across the world. Approximately 67 780 361 COVID-19 cases and 1 551 214 deaths were reported by the World Health Organization (WHO) as of December 09, 2020 with cases reported in more than 220 countries or territories (COVID-19 update, COVID-19 Effects of COVID19, 2020), after COVID-19 was declared as a world health emergency in January 2020 by WHO.

Subsequently, the country witnessed drastic rise in the number of cases across all states or union territories. Relative to the population, India’s numbers are still low, but the steep rise in absolute numbers risks overwhelming the healthcare system. The pandemic has so far claimed more than 141 360 lives in India. The national recovery rate has reached 94.66% and the case fatality rate is down to 1.45%, due to “increasing of test, tracking, timely and effective clinical management of the patients in critical care” according to Ministry of Health and Family Welfare (MOHFW) on December 08, 2020 (COVID-19 update, COVID-19 India, 2020). India tested 149 836 767 cumulative samples by December 07 and 1 022 712 samples were tested on December 08, 2020. Current status of reported positive coronavirus disease cases in India (State-wise) are presented in Fig. 1. This novel corona virus outbreak has burdened India’s economic, medical and public health infrastructure. The Gross Domestic Product (GDP) shrank by the steepest pace ever, 23.9% in the April–June period when the coronavirus brought the country to a standstill. Apart from the health-related consequences caused by COVID-19, the pandemic is likely to cost the world $90 trillion for the combined global public health and economic crises (Global Economic Effects of COVID19, 2020), after COVID-19 was declared as a world health emergency in January 2020 by WHO.

2. Clinical management

In the current, pandemic situation, a myriad of strategies would be extremely critical to battle the rapid virus spread and to treat the infection. The MOHFW, Government of India has taken several steps to spread awareness about the intensity and effects of the pandemic outbreak and has employed various measures to control the spread of COVID-19. The
## State-wise distribution of Covid-19 cases in India (Sources: MoHFW; https://www.covid19india.org)

| State / UT          | Confirmed | Active | Recovered | Death | Recovery Ratio | Case Fatality Ratio |
|---------------------|-----------|--------|-----------|-------|----------------|---------------------|
| Maharashtra        | 1859367   | 73374  | 1737080   | 3635  | 47827          | 153                 | 93.4%               | 2.6%                |
| Karnataka          | 895284    | 2280   | 25015     | 858370| 1019           | 1180                | 95.9%               | 1.3%                |
| Andhra Pradesh     | 872839    | 5429   | 860368    | 7744  | 7042           | 14                  | 98.6%               | 0.8%                |
| Tamil Nadu         | 79278     | 113    | 10588     | 770378| 1330           | 1182                | 97.2%               | 1.5%                |
| Kerala             | 644697    | 5032   | 59748     | 582351| 14735          | 2473                | 90.3%               | 0.4%                |
| Delhi              | 597112    | 13188  | 22310     | 565039| 13307          | 9763                | 94.6%               | 1.6%                |
| Uttar Pradesh      | 558173    | 11776  | 21374     | 528832| 2111           | 7967                | 94.7%               | 1.4%                |
| West Bengal        | 507995    | 12941  | 23750     | 475425| 2971           | 8820                | 93.6%               | 1.7%                |
| Odisha             | 321913    | 1349   | 3106      | 316970| 1523           | 1837                | 98.5%               | 0.6%                |
| Rajasthan          | 284116    | 1604   | 20875     | 260773| 2380           | 2468                | 91.8%               | 0.9%                |
| Telangana          | 274540    | 1682   | 7696      | 265367| 761            | 1477                | 96.7%               | 0.5%                |
| Chhattisgarh       | 249699    | 11487  | 227158    | 1525  | 3025           | 115                 | 91%                 | 1.2%                |
| Haryana            | 246679    | 11391  | 11947     | 232108| 1557           | 2624                | 94.1%               | 1.1%                |
| Bihar              | 240249    | 1684   | 5157      | 237391| 1674           | 1360                | 97.3%               | 0.5%                |
| Gujarat            | 221493    | 1325   | 14172     | 203211| 1531           | 4110                | 91.7%               | 1.9%                |
| Madhya Pradesh     | 217302    | 1345   | 13280     | 200664| 1497           | 3358                | 92.3%               | 1.5%                |
| Assam              | 214019    | 194    | 3575      | 209444| 1102           | 997                 | 97.9%               | 0.5%                |
| Punjab             | 157331    | 492    | 7274      | 145093| 792            | 4964                | 92.2%               | 3.2%                |
| Jammu and Kashmir  | 114038    | 1470   | 4995      | 107282| 524            | 1761                | 94.1%               | 1.5%                |
| Jharkhand          | 110639    | 1182   | 1753      | 107898| 188            | 988                 | 97.5%               | 0.9%                |
| Uttar Pradesh      | 79141     | 1632   | 5399      | 71541 | 1436           | 1307                | 90.4%               | 1.7%                |
| Goa                | 48835     | 1159   | 1310      | 46924 | 1146           | 701                 | 95.9%               | 1.4%                |
| Himachal Pradesh   | 46201     | 504    | 7577      | 37837 | 1808           | 743                 | 81.9%               | 1.6%                |
| Puducherry         | 37311     | 141    | 388       | 36308 | 45             | 615                 | 97.3%               | 1.6%                |
| Tripura            | 32922     | 128    | 427       | 32102 | 115            | 370                 | 97.5%               | 1.1%                |
| Manipur            | 26396     | 171    | 2919      | 23166 | 1169           | 311                 | 87.8%               | 1.2%                |
| Chandigarh         | 18239     | 126    | 962       | 16981 | 182            | 296                 | 93.1%               | 1.6%                |
| Arunachal Pradesh  | 16395     | 735    | 15605     | 55    | 55             | 55                  | 95.2%               | 0.3%                |
| Meghalaya          | 124160    | 796    | 602       | 11686 | 113            | 122                 | 94.2%               | 1%                  |
| Nagaland           | 11479     | 161    | 628       | 10666 | 18             | 67                  | 92.9%               | 0.6%                |
| Ladakh             | 8969      | 173    | 793       | 8054  | 142            | 122                 | 89.8%               | 1.4%                |
| Sikkim             | 5213      | 113    | 364       | 4639  | 20             | 117                 | 89%                 | 2.2%                |
| Andaman and Nicobar Islands | 4778 | 75 | 70 | 4647 | 116 | 61 | 97.3% | 1.3% |
| Mizoram            | 3968      | 132    | 198       | 3764  | 6              | 94.9%               | 0.2%                |
| Doda and Nagar Haveli and Daman and Diu | 3345 | 15 | 21 | 3293 | 12 | 2 | 98.4% | 0.1% |

**Sample tested**
Cumulative total
Up to December 7 148 814 055 on December 8 1 022 712

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Fig. 1. State-wise distribution of Covid-19 cases in India (Sources: MoHFW; https://www.covid19india.org).
Government of India is encouraging and rigorously enforcing the practice of isolation, contact tracing, social distancing and wearing of mask and had implemented a complete nationwide lockdown to prevent the spread of the virus. The MOHFW and Government of India has implemented the new protocol for the clinical management of COVID-19 and the protocol also mentions the directions for investigational therapies such as the use of remdesivir, tocilizumab, convalescent plasma therapy and prophylactic dose of low-molecular weight heparin such as enoxaparin. Dexamethasone, a corticosteroid, has also been included in the treatment protocols for COVID19 patients in moderate to severe stages of illness among other therapeutic measures (Clinical management protocol COVID-19 India, 2020). The use of azithromycin in combination with hydroxychloroquine (HCQ) to treat patients with severe coronavirus infections has been rolled back.

3. COVID-19 scenario

India is eagerly awaiting a COVID-19 vaccine to prevent COVID-19 and thereby prevent the complications and deaths resulting from the disease. The nation is the worst-hit country in Asia; it just surpassed Brazil as the country with the second-highest number of cases, after the United States. India recorded its highest single-day spike with 97,894 cases on September 16, 2020. The spike is also the highest daily cases of any country in the world since the pandemic outbreak. Maharashtra has been the worst affected state in the country, Karnataka came in second place, Andhra Pradesh is the third, and Tamil Nadu has the fourth highest number of infections. With the opening up of more activities due to a variety of region-specific reasons such as poverty, labour migrations and economic slowdown the state and central government were forced to provide relaxations (Ranga et al., 2020) from September 1, 2020. With unlock 4.0, more than one lakh cases per day were expected. However, a gradual drop is being seen in the number of daily cases and since mid-September this has been consistent. The daily cases have dropped from about one lakh to nearly 60,000 in October 31, 2020 and 31,179 in November 30, 2020 despite ramping up testing capacity. After five months of suspension, metro rail services resumed in selected parts of the country. With facemasks and social distancing protocols being mandatory, only asymptomatic people will be allowed to board the trains. Even today, citizens of India continue to be frightened into compliance and are “afraid to restart their lives normally”. Though many states of India have flattened their COVID-19 infection curve, authorities across the nation are now fearing the onset of a “second wave of infection” due to festival crowding as well as monsoon. Govt. Of India has advised the citizens to take precautionary measures like social distancing and wearing of mask during public gathering. Further, few states like Maharashtra, Rajasthan, Gujarat, etc. have introduced new restrictions such as travel restrictions and night curfew to battle a second wave.

4. COVID-19 related clinical trials

Seven Indian pharmaceutical companies namely Bharat Biotech, Serum Institute, Zydus Cadila, Panacea Biotec, Indian Immunologicals, Mynvax and Biological E have initiated the development of COVID-19 vaccine in India. The Drug Controller General of India (DCGI) has granted permission to start phase I and II human clinical trials of the most advanced vaccines of Bharat Biotech and Zydus Cadila, named Covaxin (Clinical Trials Registry-India (CTR)): CTRI/2020/07/026 300) and ZyCoV-D (CTRI/2020/07/026 352), respectively. The Indian Council of Medical Research (ICMR) has developed the indigenous COVID-19 vaccine (BBV152 COVID-19 vaccine or Covaxin) partnered with Bharat Biotech International Limited (BBIL). The Phase-III human trials of indigenous COVID-19 vaccine Covaxin has already begun at All India Institute of Medical Science (AIIMS) in New Delhi. The Council of Scientific and Industrial Research (CSIR), India is working towards the development of activated vaccines such as RNA vaccines and recombinant DNA vaccine. Serum Institute of India, which is handling the clinical trials in India, has already received a nod from India’s top drug regulatory body for conducting phase-II and III clinical trials on ‘Covishield’ vaccine (CTRI/2020/08/027 170) and has an agreement with AstraZeneca to manufacture and market the vaccine in India. Unfortunately, Covishield trials were stopped as a precautionary measure after one of the volunteers in the UK trials was diagnosed with transverse myelitis. Twelve weeks ago, Serum Institute of India restarted the clinical trial after a shot pause. Moreover, the clinical trials of favipiravir indicate that early treatment with favipiravir may improve clinical outcomes for patients with mild to moderate COVID-19 infection and could potentially prevent patients from progressing to ARDS and mortality. Furthermore, Zydus Cadila has received approval from the DCGI to start the phase 3 clinical trials of its biological therapy Pegylated Interferon alpha-2b or PegIHeP in COVID-19 patients. Very recently, Indian drug maker Dr Reddy’s Laboratories (DRL) has signed the agreements with Russian Direct Investment Fund (RDIF) for conducting final-stage human trials of Russia’s Sputnik V Covid-19 vaccine in India, with an aim to distribute 100 million doses to Indians beginning in the late 2020. DCGI has also granted permission for conducting trials. Short while ago, Pfizer India has sought permission from the DCGI to import the vaccine (Pfizer/BioNTech vaccine against COVID-19) for sale and distribution in the country. But the challenge of logistical issues linked to the distribution of this vaccine to smaller towns and rural areas remains as the vaccine needs to be stored at a temperature of ~70 °C. Serum Institute of India has also sought government approval for emergency use of the coronavirus vaccine (The Indian Express, 2020). Pharmaceutical companies and government agencies worldwide are working round the clock to find a vaccine against the virus. There are more than 163 candidate vaccines in development worldwide, of these 51 vaccines are in clinical evaluation with 13 candidates moving into the final phase of testing (Mullard, 2020; COVID-19 Candidate Vaccines, COVID-19 update. WHO, 2020). Moreover, around 172 countries are engaging with the COVAX facility designed to ensure equitable access to Covid-19 vaccines. The WHO is also coordinating global efforts to develop a vaccine, with an eye toward delivering two billion doses by the end of 2021 (Coronavirus coverage, 2020).

5. Ayush

Traditional, complementary and alternative medicine systems have a long history and also play an important role in providing primary healthcare to populations. In India, the published data provide fruitful evidence of the antiviral properties of the traditional formulations of the Ayush systems of medicine (Muthappan and Ponnaiah, 2020). Indian Systems of Medicine (ISM) is defined as systems of medicine which are considered to be of Indian origin or the medicine systems which have adapted to the Indian culture. India has unmatched alternative systems of medicine in the form of Ayurveda, Yoga and Naturopathy, Unani, Siddha and Homeopathy, which are now jointly referred to as Ayush, recognized by the Government of India (Rudra et al., 2017). Ministry of Ayush, Govt. Of India has also issued an “Advisory on Coronavirus” to manage this outbreak and this broadly comprises of preventive and prophylactic symptom management of COVID-19 like illnesses and also insights to interventions based on Ayush systems of medicine through evidences for immunity boosting as well as relieving the respiratory symptoms. Since the beginning of the pandemic in India, the sale of local immunity boosting products has increased drastically. Several states have started including Ayush systems of medicine in their strategy to fight COVID-19, and also certain food ingredients to naturally boost one’s immunity. The world has seen how certain traditional Indian ingredients and homemade products have benefited mankind. The advisory has also suggested Ayush medicines as add on interventions to the conventional care. These are presented in Table 1 (Ministry of Ayush, Government of India, 2020). In total 125 studies were registered in CTRI as of 11th July in which 87 (69.6%) were trials exploring Ayurvedic interventions followed by Homeopathy (12%) and Siddha (11.2%). (Charan et al., 2020).
Most were sponsored by the government and various stakeholders associated with the Ministry of AYUSH. Currently, several prophylactic, observational and interventional clinical trials are in progress at a good pace to evaluate the safe and effective use of AYUSH medicines in participants with COVID-19 infection. Further, more data continue to pace to evaluate the safe and effective use of AYUSH medicines in parallel with the Ministry of AYUSH. Currently, several prophylactic, most were sponsored by the government and various stakeholders associated with the Ministry of AYUSH. The AYUSH approach to manage the outbreak of pandemic includes drinking of adequate amount of warm water, immunity promoting AYUSH medicines, personal hygiene, practice of Yogasana, Pranayama and meditation, balanced nutritious diet, avoid smoking and consumption of alcohol and self-health monitoring at home. Moreover, the protocol also emphasized that the recovered individuals should be encouraged to share their positive experiences with their friends and relatives for creating awareness. The first follow up visit (physical/telephonic) should be within 7 days after discharge, preferably at the hospital where he/she underwent treatment. Subsequent treatment/follow up visits may be with the nearest qualified allopathic/AYUSH practitioner/medical facility of these systems of medicine (Post COVID management protocol, 2020). In the present scenario lack of vaccine and drugs to prevent or treat coronavirus patients is a challenge for healthcare professionals. Hence, exploring every possible treatment strategy is essential and might prove beneficial for containing COVID-19 infection. MOHFW and Ministry of AYUSH are the two pillars of the Indian health care system to manage the current pandemic outbreak. Data from on-going clinical trials of vaccines for COVID-19 and AYUSH medicines for prophylaxis, and symptomatic relief in COVID-19 infected patients are awaited with much interest.

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- We declare no competing interests.

**Declaration of competing interest**

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### Table 1

**AYUSH approach to manage the outbreak of pandemic.**

| Medical system Name | Preventive and prophylactic | Symptom management of COVID-19 like illnesses | Add on interventions to the conventional care |
|---------------------|----------------------------|---------------------------------------------|---------------------------------------------|
| Ayurveda            | Samsamani Vati 500 mg: twice a day with warm water for 15 days. The medicine contains aqueous extract of Tinospora cordifolia. | AYUSH-64: 2 tablets twice a day. Agasthya Haretesi: 5 gm twice a day with warm water. | AYUSH-64: 2 tablets twice a day. Agasthya Haretesi: 5 gm twice a day with warm water. |
| Siddha              | Nilavembu Kudinier decoction 60 ml: twice a day for 14 days. The medicine contains aqueous extract of Andrographis paniculata & others. | AYUSH-64: 2 tablets twice a day. Agasthya Haretesi: 5 gm twice a day with warm water. | AYUSH-64: 2 tablets twice a day. Agasthya Haretesi: 5 gm twice a day with warm water. |
| Unani               | Preparation of decoction by boiling Behidan (Cydonia oblonga) 3 gm, Unnab (Zizyphus jujube) 5 ml in number. Sapitan (Cordia myxa) 9 in number in water. This decoction may be taken twice a day for 14 days. | AYUSH-64: 2 tablets twice a day. Agasthya Haretesi: 5 gm twice a day with warm water. | AYUSH-64: 2 tablets twice a day. Agasthya Haretesi: 5 gm twice a day with warm water. |
| Homeopathy          | Arsenicum album 30: daily once in empty stomach for three days. The dose should be repeated after one month by following the same schedule till coronavirus infections prevalent in the community. | AYUSH-64: 2 tablets twice a day. Agasthya Haretesi: 5 gm twice a day with warm water. | AYUSH-64: 2 tablets twice a day. Agasthya Haretesi: 5 gm twice a day with warm water. |
|                     | Various medicine which found to be effective in treating flu like illness are Arsenicum album, Bryonia alba, Rhus toxicodendron, Belladonna Gelsemium Eupatorium perfolia tum. All these medicines should be taken in consultation with qualified physicians of respective AYUSH systems. | AYUSH-64: 2 tablets twice a day. Agasthya Haretesi: 5 gm twice a day with warm water. | AYUSH-64: 2 tablets twice a day. Agasthya Haretesi: 5 gm twice a day with warm water. |
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