



Commentary

The current situation of COVID-19 in India

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ABSTRACT

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-CoV2) 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 update, WHO, 2020). The number of people infected by the coronavirus in India crossed 9.74 million; nearly eleven - months after the country reported its first case in the state of Kerala on January 30, 2020 (Kumar et al., 2020). 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.

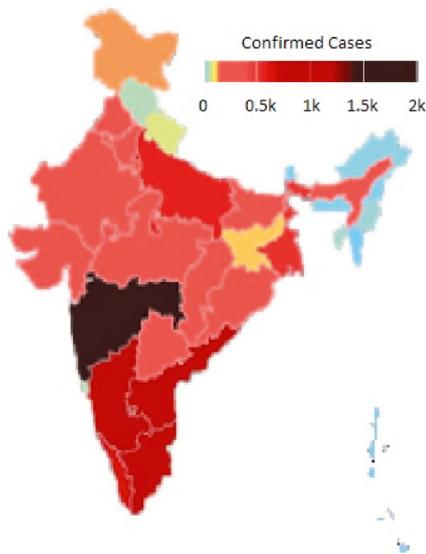
2. Clinical management

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

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Confirmed cases
9 735 975 (↑132061)
 Recovered
9 215 581 (↑136635)
 Deaths
141360 (↑1402)
 Active cases
378909



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

State / UT	Confirmed	Active	Recovered	Death	Recovery Ratio	Case Fatality Ratio
Maharashtra	1859367↑14026	73374	1737080↑3635	47827↑53	93.4%	2.6%
Karnataka	895284↑1280	25015	858370↑1019	11880↑13	95.9%	1.3%
Andhra Pradesh	872839↑551	5429	860368↑744	7042↑4	98.6%	0.8%
Tamil Nadu	792788↑1236	10588	770378↑1330	11822↑13	97.2%	1.5%
Kerala	644697↑5032	59748	582351↑4735	2473↑31	90.3%	0.4%
Delhi	597112↑3188	22310	565039↑3307	9763↑57	94.6%	1.6%
Uttar Pradesh	558173↑1776	21374	528832↑2111	7967↑23	94.7%	1.4%
West Bengal	507995↑2941	23750	475425↑2971	8820↑49	93.6%	1.7%
Odisha	321913↑349	3106	316970↑523	1837↑6	98.5%	0.6%
Rajasthan	284116↑1604	20875	260773↑2380	2468↑20	91.8%	0.9%
Telangana	274540↑682	7696	265367↑761	1477↑3	96.7%	0.5%
Chhattisgarh		191516	227158↑1525	3025↑15	91%	1.2%
Haryana	249699↑1467		232108↑1557	2624↑13	94.1%	1.1%
Bihar	240249↑684	5157	233791↑674	1300↑3	97.3%	0.5%
Gujarat	221493↑1325	14172	203211↑1531	4110↑15	91.7%	1.9%
Madhya Pradesh	217302↑1345	13280	200664↑1497	3358↑11	92.3%	1.5%
Assam	214019↑94	3575	209444↑102	997↑2	97.9%	0.5%
Punjab	157331↑492	7274	145093↑792	4964↑30	92.2%	3.2%
Jammu and Kashmir	114038↑470	4995	107282↑524	1761↑6	94.1%	1.5%
Jharkhand	110639↑182	1753	107898↑188	988	97.5%	0.9%
Uttarakhand	79141↑632	5399	71541↑436	1307↑12	90.4%	1.7%
Goa	48935↑159	1310	46924↑146	701	95.9%	1.4%
Himachal Pradesh	46201↑504	7577	37837↑808	743↑14	81.9%	1.6%
Puducherry	37311↑41	388	36308↑45	615	97.3%	1.6%
Tripura	32922↑28	427	32102↑15	370	97.5%	1.1%
Manipur	26396↑171	2919	23166↑169	311↑2	87.8%	1.2%
Chandigarh	18239↑126	962	16981↑82	296↑3	93.1%	1.6%
Arunachal Pradesh	16395	735	15605	55	95.2%	0.3%
Meghalaya	124160↑96	602	11686↑113	122↑2	94.2%	1%
Nagaland	11479↑61	628	10666↑8	67↑1	92.9%	0.6%
Ladakh	8969↑73	793	8054↑42	122↑1	89.8%	1.4%
Sikkim	5213↑13	364	4639↑20	117	89%	2.2%
Andaman and Nicobar Islands	4778↑5	70	4647↑16	61	97.3%	1.3%
Mizoram	3968↑32	198	3764↑8	6	94.9%	0.2%
Dadra and Nagar Haveli and Daman and Diu	3345↑5	21	3293↑2	2	98.4%	0.1%

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 COVID-19 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 (CTRI): 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](#)).

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	Samshamani Vati 500 mg: twice a day with warm water for 15 days. The medicine contains aqueous extract of <i>Tinospora cordifolia</i> .	AYUSH-64: 2 tablets twice a day. Agasthya Hareetaki: 5 gm twice a day with warm water. Anuthaila/Sesame oil: 2 drops in each nostril daily in the morning.	AYUSH-64: 2 tablets twice a day. Agastya Hareetaki: 5 gm twice a day with warm water.
Siddha	Nilavembu Kudineer decoction 60 ml: twice a day for 14 days. The medicine contains aqueous extract of <i>Andrographis paniculata</i> & others.	Nilavembu Kudineer/Kaba Sura Kudineer decoction: 60 ml twice a day. Adathodai Manapagu syrup: 10 ml twice a day.	Vishasura Kudineer: decoction: 60 ml twice a day. Kaba Sura Kudineer decoction: 60 ml twice a day.
Unani	Preparation of decoction by boiling Behidana (<i>Cydonia oblonga</i>) 3 gm, Unnab (<i>Zizyphus jujube</i>) 5 in number. Sapistan (<i>Cordia myxa</i>) 9 in number in water. This decoction may be taken twice a day for 14 days.		
Homoeopathy	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 corona virus infections prevalent in the community.	Various medicine which found to be effective in treating flu like illness are Arsenicum album, Btyonia alba, Rhus toxica dendron, Belladonna Gelsemium Eupatorium perfolia tum. All these medicines should be taken in consultation with qualified physicians of respective AYUSH systems.	Medicine mentioned symptom management of COVID-19 like illnesses.

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 emerge, stressing on the beneficial effects of AYUSH medicines through controlled clinical trials which might be potent to treat novel coronavirus.

6. Post COVID management protocol

Although, the mortality rates for COVID-19 cases in India remain less than 2%, long term complications among survivors of the infection having clinically significant disease are not yet available. The post-infection complications are rising and this is the major concern for upcoming years. Most of the patients are managing well in isolation during the first 10 days, but many are also developing breathing difficulties after turning COVID-19 negative. Only follow-up studies will clarify the extent

of the sequelae on organ functions, such as respiratory, renal, cardiovascular, as well as psychological or psychiatric disorders and related chronic pain. MOHFW, Government of India has published the post COVID-19 management protocol which 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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Declaration of interests

We declare no competing interests.

Declaration of competing interest

The author declares no conflict of interest.

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