



The COVID-19 Pandemic and the Public Health System Challenges in India

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Author's contribution

The sole author designed, analyzed, interpreted and prepared the manuscript.

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ABSTRACT

This paper attempts to provide an overview of the COVID-19 pandemic situation in India and highlights various public health system challenges faced by the country in its efforts to control the pandemic. This paper is based on extensive review of literature conducted to stimulate pertinent descriptive information on COVID-19 pandemic and public health system challenges in India. The COVID-19 pandemic has created unprecedented challenges on India's public health system. India has implemented several strategies to mitigate the pandemic, but the rapid spread of the virus poses huge challenges of hitherto unseen scale on multiple fronts. India's public health system is chronically underfunded, leading to a shortage of COVID-19 treatment facilities. Even the available health resources are unevenly distributed across states resulting in huge disparities in emergency preparedness and management of the pandemic. Due to lack of robust primary health care system and effective public health strategies, vulnerable population in most states are prone to the pandemic and risk of severe complications. The findings can draw attentions of health policy makers to develop appropriate policy for future pandemic preparedness and management.

Keywords: Covid -19; public health system challenges; health workforce; health policy; India.

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1. INTRODUCTION

The “2019 coronavirus (COVID-19) pandemic, caused by severe acute respiratory syndrome coronavirus 2 (SARS-CoV-2) has resulted in more than 126 million infections and 2.78 million deaths worldwide by the end of March 2021 [1]. The pandemic has made a devastating impact to the global economy after the Great depression in 1930. In repose to the pandemic, more than 186 countries across the globe have implemented lockdown with stringent social distancing measures [2,3]. India, the second most affected country in the world has reported nearly 12.04 million of confirmed cases and 0.16 million deaths by this time [1]. Many countries including India, is currently going through a second surge in infections. The first COVID-19 case in India was reported on 30 January 2020, since then the number of cases has increased at an alarming rate [4]. As an immediate measure to control the pandemic, the Indian government implemented the nation-wide lockdown on 24 March, 2020, subsequently extended till 31 May 2020 in four phases.

National lockdown was the immediately available strategy to the control of the pandemic in India. The government has promptly responded at multiple levels to prevent the spread of the virus. The lockdown has helped to revamp the testing facilities and most importantly preparing the health system to respond to the pandemic. However, the rapid spread of COVID-19 poses mammoth challenges of a hitherto unseen scale. India faces innumerable challenges in controlling the spread of virus especially with a huge share of daily wage earners, slum dwellers and migrant workers in urban areas. Other factors like high population density, low socio-economic status of population and lack of access to public health services make the country vulnerable to the pandemic [5,6]. National lockdown has led to economic hardships, huge unemployment, poverty, indebtedness, gender-based violence and other social problems. These socio-economic issues lead to increasing mental challenges like anxiety, stress and depression among the population. As the pandemic has spread from its initial base in large cities to semi-urban conglomerations and villages, the pre-existing disparities in health care delivery across the country have further exacerbated [7].

The lockdown has disrupted the provision of basic health services such as life-saving medical treatment, inpatient and outpatient services and

emergency treatment for infectious diseases. It also affected the utilization of maternal health care services, child vaccinations and diagnostic services [8]. Most affected are the elderly suffering from non-communicable diseases (NCDs) like heart diseases, diabetes, hypertension, and chronic respiratory diseases. Global experiences indicate that high risk mortality in COVID-19 patients is attributed to these co-morbidities [9,10]. Most deaths due to COVID-19 are largely premature, with more than 50% occurring in the age group of 40-64 years [5]. Additionally, health workers who are the most critical resources at the time of a pandemic are infected with the virus due to their constant exposure to infected patients. They are susceptible to psychological distress due to personal safety, fear about infecting their family members, stigma against the disease and aggression against them.

At the outset of the pandemic, the government declared free treatment for COVID-19 at public health facilities throughout the country, but the pandemic put enormous pressure on the existing health infrastructure and workforce. There are widespread shortage of intensive care unit (ICU) beds, ventilators and personal protective equipment (PPE) kits and shortages in medical supplies. Compounding to these factors is huge shortage of health workforce, particularly doctors and nurses trained in critical care management. The national lockdown has created a multi-dimensional effect including the delivery of services to the patients with chronic conditions, emergency cases, mother and child health services. Although India has implemented several strategies to mitigate the pandemic, but the rapid spread of the virus poses huge challenges of hitherto unseen scale on multiple fronts. The purpose of this paper is to provide an overview of the COVID-19 pandemic situation in India and highlights various public health system challenges faced by the country in its efforts to control the pandemic.

2. METHODOLOGY

This paper is based on literature review and documentation analysis. All relevant information for this paper was ascertained from a secondary source. This includes but not limited to academic literature, media reports and search using Pub Med and Google Scholar data bases. Major documents that have been significant for the paper includes research publications, policy and planning documents, government reports,

publications of the World Health Organization (WHO), reports of the Ministry of Health and Family Welfare, government websites and newspaper reports to contextualizing appropriate information. Relevant data from the websites of WHO including India country report (2020), Corona disease (2020), health emergency (2020), global health expenditure (2020) and health workforce in India (2016) were collected and included. Key policy documents and reports of Ministry of Health and Family Welfare (MOHFW) including national health profile (2019), national health accounts estimates (2019), national health policy (2017), and national health mission (2013) were used. Besides, the reports of 71st and 75th round surveys of the National Sample Survey Organization (NSSO), healthy states progressive report of NITI Ayog (2019) were included. All information thus collected was analyzed for their contents and the relevant information was included.

3. NATIONAL RESPONSES TO THE PANDEMIC

Countries followed different strategies to mitigate the spread the COVID-19. As soon as the COVID-19 infection started to spread in China, the countries like Taiwan responded swiftly by closing its borders, early precautions using artificial intelligence, big data, rapid screening and constant monitoring [11,12]. Early precautionary measures introduced in other part of China were largely successful in containing the spread of the virus. Singapore followed an aggressive approach to contact tracing including widespread testing. South Korea adopted testing, contact tracing and quarantine measures [11,12]. New Zealand and Australia controlled the virus with improved coordination between health agencies including national and local governments [11]. Canada implemented aggressive lockdown alongside widespread public communication, and testing [13]. Some of the South Asian countries determined to fight the pandemic with stringent lockdown measures in the early outbreak due to poor preparedness level [11]. Few countries have imposed only localized lockdown in the affected areas. Most countries followed physical distancing, use of face masks, mass testing, contact tracing, isolation and treatment [13]. In Srilanka, tough restrictive measures taken by the government

including the dedication of military and health workers helped to control the pandemic [11,13].

India implemented surveillance even before the first case was officially reported at the end of January 2020 in the state of Kerala, followed by a series of travel advisories and repatriation of Indian nationals including mandatory implementation of quarantine requirements [14]. During the national lockdown, all international and domestic flights, interstate and intrastate travel and other forms of public transportations were halted. Only essential travel to hospitals, pharmacies, grocery shops, gas stations, banks and other emergencies were allowed and movement of people were closely monitored by the states [15]. Unexpected lockdown had severely impacted millions of the population, particularly the migrant workers and daily wage earners [16,17]. In order to mitigate the economic impact of these workers, the government introduced several measures including provision of food grains and cash transfer to vulnerable sections [18,19].

With the occurrence of the virus, the government invoked the provision of epidemic disaster act, 1897. Apart from training health workers, steps were taken for the expansion of testing facilities, production of ventilators, ICU beds, and PPE kits. The government also introduced a health insurance scheme for health workers fighting COVID-19 [19]. The Union Ministry of Health and Family Welfare (MoHFW) issued guidelines focusing on public health interventions such as massive awareness generation, mandatory implementation of social distancing norms, clinical management guidelines for COVID-19 treatment including mobilization of resources from the private sector [20]. All basic information related to prevention and control of COVID-19 was widely disseminated in local languages through websites of respective state health departments and all other media. MoHFW coordinated the efforts of states and districts in dissemination of information and monitor the uniform implementation of guidelines at all levels. The government directed all cellular networks in the country to promote COVID-19 awareness ring tone explaining the signs and symptoms of COVID-19 including medical helpline numbers [21]. The government also issued regulations and penalties for the spread of false information

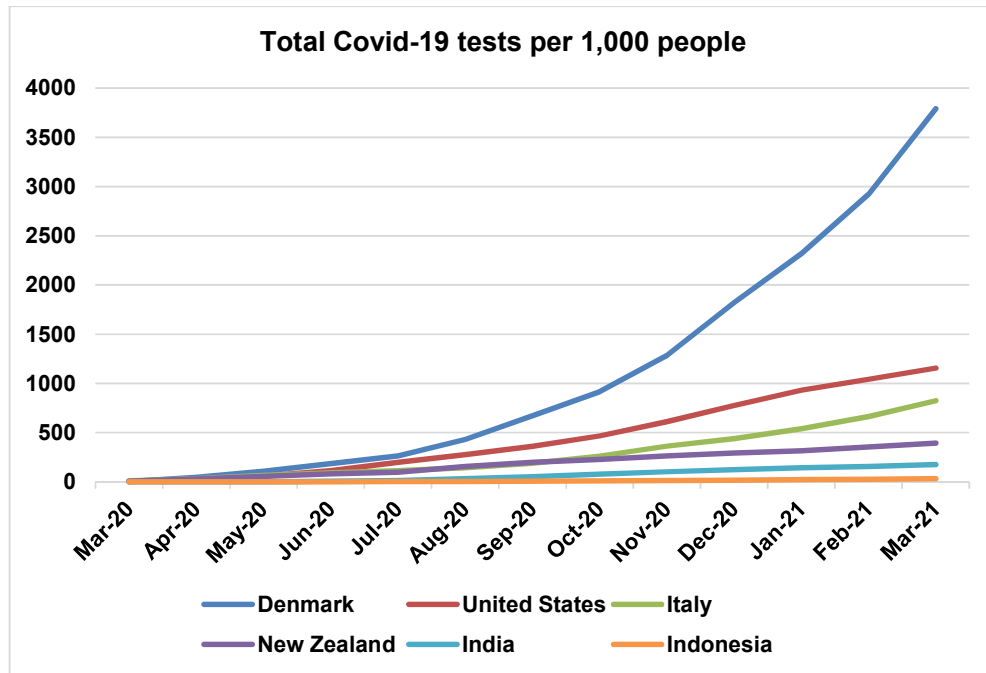


Fig.1. Total number of COVID-19 tests conducted per 1000 people in select counties
 Source: <https://ourworldindata.org/grapher/full-list-cumulative-total-tests-per-thousand>

and unproven therapies or myths through social media and other channels [21]. MoHFW website has incorporated blogs and information to address fact checks or myths and twitter platform to promote communication and promptly answer queries [22]. At the grassroots level, local authorities were empowered to promote awareness in villages.

Initially, the National Institute of Virology (NIV), located in Pune (Maharashtra) was the only approved laboratory in the country to test for COVID-19 [21]. By the end of November 2020, there were 1191 government laboratories and 1042 private laboratories available across the country for conducting COVID-19 tests [23]. Despite increase in testing capacity, India's progress in COVID-19 test is much lower compared to other countries in the world [Fig.1]. Currently, India conducts 203,220 Covid test per million people, compared to 2,222,650 in the United Kingdom and 1,329,575 in the United States [24]. Despite series of lockdowns, the number of COVID-19 cases continued to increase in the country particularly in large metropolitan cities like Delhi, Mumbai and Chennai. There are innumerable health system related challenges that adversely affect the nation's efforts to mitigate the pandemic.

4. HEALTH SYSTEM CHALLENGES

4.1. Public Health Funding

India's response to COVID-19 pandemic continues to be driven by its public health care system, which is faced with chronic underfunding and shortage of health workforce [25]. According to the report of Global Health Security Index (2019), India ranked 57th out of 195 countries in terms of emergency preparedness and capacity [26]. Its overall health score of 46.5 was above the global average of 40.2, but much lower than countries in Asia such as Indonesia (56.6) and Thailand (73.2). According to WHO data [27], India's public expenditure on health care was about 1% of its GDP in 2018, which is much lower than other countries in the region like Maldives (6.65%), China (3.02%) and Thailand (2.8%) [Fig. 2].

India's per capita government health expenditure was \$16 in 2016, which is quite low compared to \$8,078 of the United States [28]. This low health expenditure by the government, evidently leads to many problems including shortage of health infrastructures, health workforce and drug supplies. Despite improvements in medical and health education scenario during the last few years, the country has an average of one

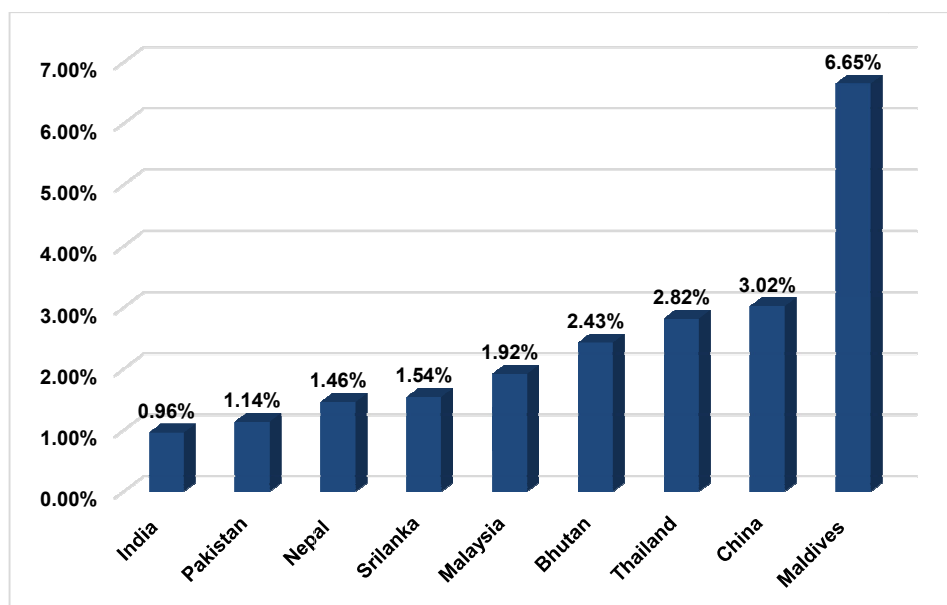


Fig. 2. Public health expenditure as percentage of gross domestic product in selected Asian countries (2018)

government allopathic doctor for 10,926 people, which is almost 10 times higher than the WHO norm of 1:1000 people [28]. Only four states have the WHO recommended health workforce density of 44.5 per 10,000 population [29]. According to the WHO, India needs additional 0.6 million doctors and 2 million nurses in the public health system to meet WHO standards [30].

Government hospitals have extremely low availability of beds despite being the major source of treatment facilities for the poor. Data shows that only 10% of all registered doctors work in government hospitals. India has on the average 1.5 hospital beds per 1000 population in both public and private sectors (world average - 2.60 & the WHO norm 3.50), while 80% of these hospital beds are in the private sector [28]. There has been huge shortage of health infrastructure and workforce in public health system in rural areas across different states, leading to poor access to public health services. As a result, a major chunk of population seeks private health care by incurring huge out-of-pocket expenditure (OOPE); and for the poor this becomes catastrophic. It is estimated that every year about 57 million people are pushed into poverty [31]. According to the recent estimate, OOPE constitutes 63.2% of total health spending in India in the year 2016-17 [32]. NSSO data indicates that almost one-fourths of rural

households in India depend on borrowings for meeting hospitalization expenses and health insurance or financial protection covers less than 20% population [31]. Therefore, in the absence of universal health coverage, OOPE remains the major source of financing for health care in India [33]. In such situation, treatment for COVID-19 is a huge challenge for the majority of the poor in rural areas [34].

Almost two-thirds of confirmed COVID-19 cases are reported from urban areas, which constitute about 35 % of population, exposing the vulnerability of cities and deficiencies in urban public health system [35]. A recent analysis on regional variations in COVID-19 outbreak showed that almost 60%-70% of all confirmed COVID-19 cases were reported from highly urbanized districts [36] of various states since the inception [Table.1]. Many large urban conglomerations lack provision of comprehensive public health services, particularly sub-urban towns and newly developed areas. Although the national urban health mission (NUHM) launched in 2013 committed to improve the persisting public health problems, budget allocated to the program is just 1.4% of the central ministry's health budget [37]. The focus of urban local bodies like municipal corporations are mainly on existing hospitals rather than improving primary health services in new settlements.

Table. 1. Confirmed Covid -19 cases in districts according to percentage of urban population

Date	Total number of confirmed cases in India	States with 31% and more urban population		States with below 31% urban population	
		Highly urbanized districts	Lower urbanized districts	Highly urbanized districts	Lower urbanized districts
22-03-2020	401	236 (65.6%)	48 (12%)	62 (15.5%)	28 (7.0%)
07-04-2020	5271	3220 (61.1%)	762 (14.5%)	857 (16.3%)	432 (8.2%)
21-04-2020	19803	12655 (63.9%)	1715 (8.7%)	3821 (19.3%)	1612 (8.1%)
05-05-2020	48129	33115 (68.8%)	4112(8.5%)	7638 (15.9%)	3264 (6.8%)
19-05-2020	99182	70456 (71%)	7984 (8.1%)	12118 (12.3%)	8554 (8.6%)
03-06-2020	188947	130188 (68.9%)	15541(8.2%)	19013 (10.1%)	24205 (12.8%)
01-07-2020	502081	354618 (70.6%)	47707 (9.5%)	40477 (8.1%)	59279 (11.8%)
01-08-2020	1579644	968680 (61.3%)	267777 (17.1%)	142806 (9.0%)	200381(12.7%)
11-08-2020	2194849	1217953 (55.5%)	419808 (19.1%)	215661(9.8%)	341427 (15.6%)

Source: extracted from Gupta D, Biswas D, Kabiraj (2021)

4.2 Disparities in Health Resources

COVID-19 pandemic preparedness and its policy responses have been diverse across Indian states, primarily due to variation in availability of health resources. A recent study estimating vulnerability index for the management and response to COVID-19 showed high overall vulnerability index in larger states located in every region of the country like Madhya Pradesh (1.00), Bihar (0.971), Telangana (0.943), Jharkhand (0.914), Uttar Pradesh (0.886), Maharashtra (0.829), West Bengal (0.829), and

Odisha (0.800) [Fig 3]. The authors used five key domains which are considered significant in the context of COVID-19 such as socio-economic conditions, demographic composition, housing and hygiene condition, availability of healthcare facilities and COVID-19 related epidemiological factors [38]. As states are at different stages of development, the gap between the rich and poor states is still quite large, which means low-income states are unable to spend more on health care in comparison to higher income states, which reflect on poor availability of health services in low income states.

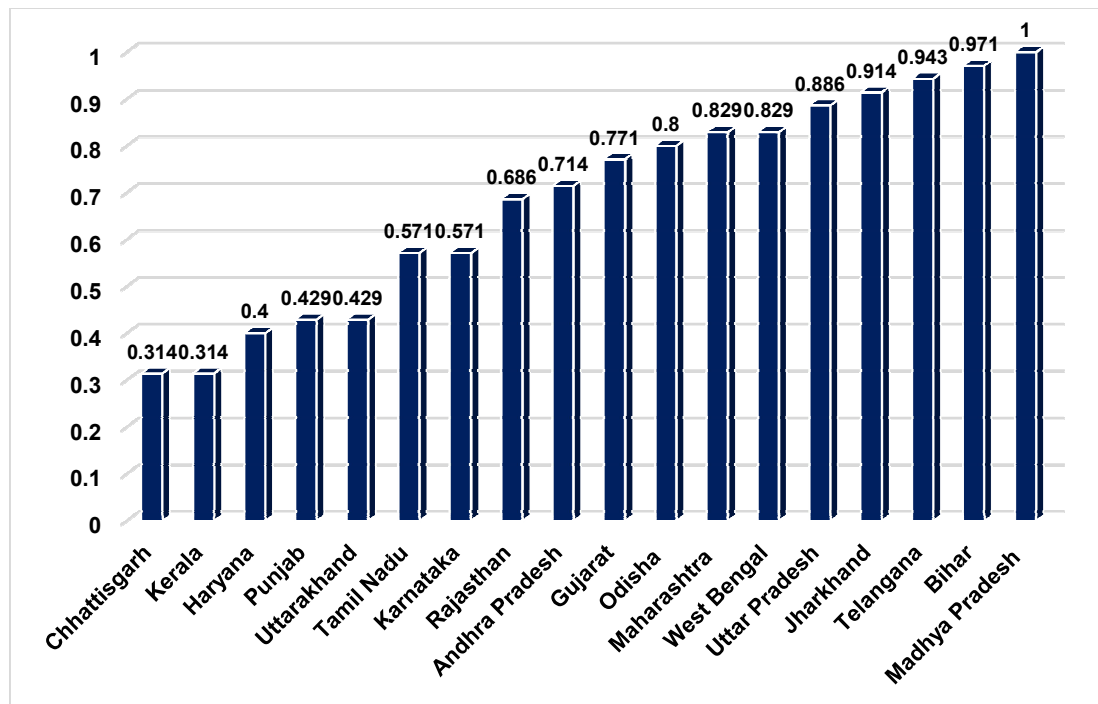


Fig. 3. Overall vulnerability index by major states in India

There is a huge disparity among major states with regard to availability of government hospital beds and government doctors; while Delhi has 14.5 government hospital beds for 10,000 people, the state of Bihar has only 1.1 per 10,000 people. Likewise, Delhi has 5.4 government doctors per 10,000 people, the corresponding figures for Bihar and Jharkhand states are 0.3 and 0.5 respectively [28]. An estimate based on NSSO data for 2011-12 showed the density of doctors, nurses and midwives per 10,000 people as 29.1 (doctors, health associates, nurses and midwives), which falls short of revised minimum need of 44.5 health professionals per 10,000 people [29,39]. Within the country, there have been huge interstate disparities in health workforce density with Delhi has the highest density of 67.3 per 10,000 people to as low as 6.7 per 10,000 people in Jharkhand [39]. While cities and urban areas have more density of health workforce compared to rural districts, many of the poor states with predominant rural people have severe shortage of health workforce. Only 36% of health workforce is available to serve population in rural areas who constitutes nearly 65% of the total population in 2016 [30,39]. Another challenge is the huge shortage of specialist doctors in the rural areas in major states. According to the report of MoHFW, the overall shortage of medical specialists in community health centres in rural India was 81.8% in 2017-18 [28]. District hospitals in states like Chhattisgarh (70.8%), Uttarakhand (68%) and Bihar (59.7%) have reported huge vacancies of specialists as compared to Himachal Pradesh (0%) and Kerala (13.5%) [40]. Thus the shortage of health resources in rural areas of states remains a huge challenge to India's effort to control the pandemic.

4.3 Inadequate Resources for COVID-19 Treatment

Global experiences reveal that about 20% of COVID-19 cases require hospitalization and 5% require admission to an intensive care unit for situations leading to respiratory or other organ failures [41-43]. Currently, India has 1055 dedicated COVID-19 hospitals with 177529 isolation beds and 78060 oxygen supported beds. Besides, there are 2400 COVID-19 health centres with 140099 isolation beds and 51,371 oxygen supported beds [44]. There are no public database on total ICU beds capacity in the country and available estimate shows that there are nearly 95,000 beds, which

is 3.7% of acute hospital beds [45], while another estimate shows a total of 94,961 beds (59262 beds in private sector and 35699 beds in public hospitals) constituting about 7.8 ICU beds per 100,000 people [46]. A cross sectional study of 23 Asian countries indicates that there are 3.6 critical care beds per 100,000 people in Asian region while countries like the United States and Germany have 34.7 and 29.2 beds per 100,000 people respectively [45]. On an average, India has 3.9 ventilators per 100,000 people in both public and private sectors in comparison to 48 in USA, 30 in Germany and 19 in Korea [46]. The availability of critical care beds and ventilators are too short of demand in view of outpouring in total number of Covid -19 cases.

Another challenge is the huge disparities in access to acute care facilities among various states and different districts within states. While states like Karnataka and Kerala have 21.4 and 14.8 ICU beds (in both public and private sector) respectively for every 100,000 population; the corresponding figures for Bihar and Odisha are 1.8 and 3.1 respectively. Likewise, Karnataka and Kerala have 42.9 and 29.7 ventilators in public and private sector for every 100,000 population as compared to 3 and 6.1 in Bihar and Odisha respectively [46]. A survey of ICU facilities in Madhya Pradesh state revealed that 30 of 49 districts have no ICU facility and of the remaining 19 districts, most ICU facilities are concentrated in four districts [47]. Another challenge is the shortage of health workforce for delivering critical care. The number of doctors and nurses with intensive care training in the country is relatively low as compared to their requirements. This shortage has further worsened due to quarantine requirements of health workers when they are on Covid duty or come in contact with infected people. In order to meet the increasing demand for critical care delivery, a huge number of physicians and nurses should be trained in critical care management. Non-ICU health staff should also be trained in general intensive care including operation of critical care equipment and ventilator management. Rural India has not been adequately prepared to contain COVID-19 transmission due to challenges such as inadequate health infrastructure, chronic shortage of health workforce, inadequate number of hospital beds, poor accessibility and quality of care, paucity of testing services and weak surveillance system.

4.4 Disruption of Treatment for Non-COVID-19 Conditions

COVID-19 pandemic has created huge adverse consequences on patients suffering from non-covid conditions by delaying their treatment. Global experience showed almost 60%-90% of COVID-19 cases are attributable to non-communicable diseases (NCDs) like diabetes, heart diseases, acute respiratory infections and hypertension, especially among the old age population. COVID-19 deaths are mostly associated with either one or more of these comorbidities including unavailability of critical care [48,49,50]. In India, closure of outpatient clinics in secondary and tertiary hospitals during the lockdown has deprived millions of patients with chronic diseases of their regular investigations and medicine needs. Many government health facilities have been converted into dedicated COVID-19 hospitals which in turn prevent patients to avail themselves for NCD treatment for non-covid conditions.

A majority of NCD patients, particularly those which belong to poor socio-economic strata across the country is dependent on public hospitals for management of diseases. These patients are vulnerable to non-adherence to medication and diagnostic services and their problems are exacerbated due to loss of work and income compounded by lack of access to health care during the pandemic. Following various international guidelines, the MoHFW issued instructions for delivery of essential health services during the pandemic on April, 14, 2020. Following this, other hospitals in the public and private sector issued guidelines for essential health services by minimizing visits to hospitals and encouraging the use of tele-consultation or virtual consultation for outpatient services, visit to hospitals for doctor's advice, dialysis, radiotherapy and chemotherapy with necessary precautions to prevent COVID-19 transmission.

4.5 Limited Contribution of the Private Health Sector

According to NSS data for 2016, more than 80% of doctors, 90% dental practitioners, 55% of nurses and midwives were employed in the private sector [29]. Private hospitals deliver about 80% of out-patient care and 60% of inpatient care in India [51]. With the fast spread of the pandemic, the governments at the centre and states have encouraged the private sector to participate in the efforts to control COVID-19

pandemic. Though many states have announced that treatment in public and private sector hospitals are free for treating COVID-19 cases, but most of them were unable to get support from large private hospitals. Although states have issued guidelines fixing the treatment charges in private/corporate hospitals, but there are many cases where patients are charged exorbitantly higher rates. Few states have also taken actions against those hospitals overcharging patients and obtaining refunds for COVID-19 patients, who had been overcharged. States like Telangana made it compulsory to make itemized billing to make it simpler to identify overcharging by hospitals.

Under health insurance, many private hospitals have come forward to treat COVID-19 patients in few states. Maharashtra government has included several private hospitals in health insurance scheme to treat COVID-19 patients with an annual income of less than Rs.100, 000 [appx. US \$ 1370) including cap on the cost treatment [52]. Many states have introduced policies for subsidizing the COVID-19 treatment in private hospitals; but there are variations in the price cap fixed by them. The price cap in Delhi included cost of PPEs, investigations procedures, medicines, and treatment for comorbidities during treatment for COVID-19, but states like Maharashtra did not include these items. In Delhi, the government had recommended cap of Rs.1000 for COVID-19 patients who requires beds and PPEs, Rs.15,000 (appx.US\$ 205) for those requiring admission in intensive care unit, and Rs.18,000 (appx. US\$ 246) for those patients requiring ventilator support [52]. In many states, the costs of treatment in private sector have increased several times in the absence of strict regulation by the government. COVID-19 pandemic has also created a huge impact on private health sector in terms of patients flow and it is reported that private hospitals and clinics in major states have recorded a 50%- 70% fall in revenues. Further, these hospitals have to make additional investment for safety preparedness, health workforce training, equipment and other facilities.

4.6 Lack of Policy Framework

Currently, India does not have a policy framework for health workforce expansion, mobilization, motivation and support during emergencies and pandemic situations. Pandemic control requires emergency preparedness planning, identification and upskilling,

mobilization of staff from public to private sector and vice versa, involvement of non-health workforce, introducing incentive mechanisms like risk incentives; knowledge and resource sharing from stakeholders; protection of health workforce and families from social exclusion, violence and providing priority detection and treatment services; and other psycho social support measures. These are not addressed by the existing policies.

Frontline healthcare workers face a substantively higher risk of infection and death as a result of providing care of COVID-19 patients. Global experience indicates that about 10% of COVID-19 infections have been reported among health workers. Health professionals working in ICUs who are directly involved in management of COVID-19 patients reported developing depressive symptoms, and anxiety as they are working continuously in PPE kits without any breaks working for longer hours. Many of them do not have adequate provision of PPE kits for sample collection and treatment of COVID-19 cases. They are also subjected to verbal abuse, physical violence and sexual abuse. Due to stigma and fatigue, many suicides and accidents have been reported. Rapid transformation of misinformation on social media also led to mass hysteria in the community, causing increased attack on health workers.

5. HEALTH POLICY IMPLICATIONS

India's experiences with controlling the spread of COVID-19 reveal that states with strong public health system has been effective in containing the spread of the virus in comparison to states with low access to public health care. Despite various deficiencies in the public health system, about 80%-90% of critical COVID-19 cases are being treated at government health facilities [35]. India is one of the countries in the world which spends a lower share of its GDP on public health and there are huge disparities exist in public health spending across states. Per capita public health expenditure in larger states like Bihar and Uttar Pradesh are much below the national average. This clearly justifies the transformation of public health system across India, by a significant increase in public health spending from current 1.15% of GDP to 2.5% and further to 3%-4% of GDP in medium term as envisaged by the National Health Policy (2017), which requires a steady increase in the budget allocation to health sector by the state governments [53].

Global evidences show that COVID-19 pandemic has been well-contained in countries with strong primary health care system such as China, Singapore, Australia, Canada, Germany and New Zealand [54,55]. Easy access to basic primary health care is a crucial factor in the prevention, early diagnosis and treatment of infectious diseases [56]. Initial experience reveal that about 80% of the COVID-19 cases are mild, and most moderate cases seek services from the primary health care centres as a gate keeper to health care [55]. In India, states like Kerala, which has a strong presence of primary health care system could contain the pandemic in its initial stage, due to various out-reach based public health measures related to epidemic control [55]. However, many states face the shortage of primary health care infrastructure and health work force both in rural areas. Apart from strengthening primary health infrastructure in rural areas, it is also paramount to launch a massive programme for revamping of urban health services focused on primary healthcare. Despite the commitment of National Health Mission (NHM) to improve primary and secondary health services, the share of health budget allocation to NHM has declined from 56% in 2018-19 to 49% in 2020-21 budget [35,37]. Allocation of budget to primary health care should be increased keeping in view the vital role of frontline level of health care in both urban and rural areas.

6. POLICY RECOMMENDATIONS

6.1 Priority to Health Workforce Development

Health workforce plays a crucial role in surveillance and management of COVID-19 pandemic alongside providing routine health services. Health workforce including physicians, nurses, auxiliary nurse midwives, and field health workers including accredited social health activists (ASHAs) are working at substantial personal risks, without adequate personal protection. It is important to ensure that these workers are provided with all basic requirements to fulfill their functions effectively during and the post pandemic period. A large number of contractual staff in rural health system are involved in prevention and control of COVID-19 and factors like absence of job security and lower remuneration could demotivate them in undertaking activities effectively. It is estimated that nearly 0.3 million contractual staff and about 0.9 million accredited social health activists

(ASHAs) work at village level as part of NHM [19,28]. This workforce also faces the problem of shortage of PPEs and proper working conditions in rural areas.

6.2 Strengthening Primary Health Care

Understaffing at primary health care level has further increased the workload of the existing staff. MoHFW report clearly brings out the deficiencies of health work force at various levels of health care system [28]. Therefore future policies and programs should focus on improving access to primary health care, for which at least 70% of overall health budget should be allocated. The focus should be on capacity building of frontline health workers and large-scale public campaign to handle community-based capacity to handle local issues.

6.3 Addressing the Mental Health of Care Providers

During the pandemic, it is paramount to strengthen psychological health care needs of health professionals and patients at every level. Local administration in both urban and rural areas should actively involve civil society organizations and community volunteers that have the potential to reduce stigma against health workers [57-59]. In Kerala state, women's empowerment groups were organized to map older people to ensure they had access to food and medicine while self-quarantine [57]. South Korea was able to contain the pandemic through intensive testing and outreach services without resorting to lockdown [35]. Rigorous steps should also be taken to ensure safety of health workers through better infection control, provision of adequate PPEs, and mandatory quarantine of health workers on COVID-19 duty.

6.4 Control on Misinformation, Myth and Misconceptions

Mass media including social media is a powerful tool that spread misinformation and promotes fear and confusion among the public to stay safe; hence, the government is bound to control the spread of such misinformation including myth and misconceptions about the pandemic and share credible source of information related to the pandemic using appropriate media. A dedicated public relations unit with contact details should be established at every public hospital to provide guidance and accurate

information to the community during the pandemic.

6.5 Treatment of Non-Covid Conditions

Addressing the barriers in providing care and management of patients with NCDs during the pandemic is a real challenge. Any neglect of NCDs may have an adverse effect on the overall health and wellbeing of the population that far exceed the consequences of COVID-19 pandemic. Non-adherence to NCD treatment due to lack of access and affordability during the pandemic indicates the failure of health system and corrective steps are needed for developing an equitable solution for population based NCD management. Apart from providing treatment for COVID-19 patients, the government should also provide treatment for non-Covid conditions in the time of crisis, particularly essential health services, treatment for chronic diseases, emergencies, maternal and child health services. Categorization of health facilities into COVID-19 facilities and non-COVID-19 facilities in designated areas with helpline facilities will address the concerns of suspected cases and those who need other medical needs.

6.6 Dispensation of Medicines

Dispensing drugs for long duration like quarterly patient follow up in health facilities, distribution of generic drugs through Jan Aushadhi Kendras (a central government outlet) at subsidized prices or making it free to poor patients, door step delivery of essential drugs through community health workers and health volunteers proved helpful in pandemic situations. Apart from these, online start-ups for delivering medicines at the doorsteps based on prescriptions can also ensure adequate access to medicines to patients during the pandemic.

6.7 Achieving Universal Health Coverage

COVID-19 will have many long-term consequences for the Indian health system including increasing burden of OOPes, increasing share of NCDs, rising number of mental health problems and widening gaps in availability of public health resources in rural areas across states. Almost every section of the population, daily wage earners and migrant workers face huge socio-economic and health challenges due to the pandemic. Therefore, the health system priority should be on achieving universal health coverage to all segment of

population. Government should consider building an effective system for national emergency preparedness for future pandemics with more emphasis on training, research and capacity building in public health emergencies, for which a legislation or act to deal with pandemic like COVID-19 is the need of the hour.

6.8 Encourage the Private Sector Participation

India has a large private health sector which fills the vacuum where the government is unable to deliver due to low health spending, lack of health infrastructure and trained health professionals, medical technology, medical equipment and supplies. The policy should stimulate private sector's participation in health including emergency management during the pandemic. A pragmatic approach to facilitate the public private partnership will go a long way in reducing the adverse impact of the pandemic.

6.9 Integration of Emergency Preparedness and Response Plan

Emergency preparedness and response plan needs to be integrated in to India's health system. There is also a need to include public health and emergency management in policies of non-health ministries and involve them in the development and implementation of policies related to control and management of the pandemic.

6.10 Develop Innovative and Local Solutions

Future health policies should also focus on innovative ways to augment and retain trained health manpower in rural areas, establishment of well-equipped public health labs at district levels, promotion of low cost, low tech solutions for PPE, test kits and other medical devices.

7. LIMITATIONS OF THE REVIEW

This paper provides insight into the COVID-19 situation in India and highlights various public health system challenges faced by the country in its efforts to control the pandemic. However, this paper is methodically limited as it is rather an overview of literature than a systematic review. Additionally, there are many socio-economic, epidemiological, environmental, cultural and political factors, which affect the prevention and

control of the COVID-19 pandemic, are not addressed in this paper. Research studies focusing on these issues are required as the findings of these studies will contribute in developing a holistic policy for future pandemic preparedness and management.

8. CONCLUSION

COVID-19 pandemic has placed unprecedented challenges on India's public health system. The occurrence and rapid spread of COVID-19 put enormous pressure on the existing health infrastructure and workforce. Currently, the public health system capacity and pandemic preparedness are inadequate and available scare resources are unevenly distributed across states. India's public health system is chronically underfunded, with limited focus on primary health care in both urban and rural areas. Due to lack of robust primary health care system and effective public health strategies vulnerable population in most states are prone to the pandemic and risk of severe complications. Apart from improving primary health care infrastructure, a huge number of frontline health workers should be trained in prevention and management of disaster and mobilize them to priority services. Effective strategies should also be devised to reduce the chances of infections and improve mental health services to health professionals. The pandemic thus reiterates the significance of strong public health system and the need for increasing investment in India's public health system. India should also learn from the experiences of the current pandemic and turn the challenges into opportunity to improve its health delivery system, reduce the disparities in access to health care across states and create a comprehensive system to combat future pandemic. Thus, the impact of COVID-19 pandemic will have significant challenges for priority settings of future health policies.

CONSENT

It is not applicable.

ETHICAL APPROVAL

It is not applicable.

COMPETING INTERESTS

Author has declared that no competing interests exist.

REFERENCES

1. World Health Organization. Novel Coronavirus disease (COVID-19) situation update report. 2021;61. Available:https://cdn.who.int/media/docs/default-source/wrindia/situation-report/india-situation-report-61.pdf?sfvrsn=ce41440b_4.
2. Han E, Tan MMJ, Turk E, Sridhar D et al. Lessons learnt from easing COVID-19 restrictions: an analysis of countries and regions in Asia Pacific and Europe. *The Lancet*. 2020;396(10261):1525-1534.
3. Chatterjee P. Gaps in India's preparedness for COVID-19 control. *Lancet Infect Dis*. 2020;20(5):544.
4. World Health Organization. Health emergency dashboard [updated]; 2020. Cited 2020 Dec 17]. Available: <https://covid19.who.int/region/searo/country/in>
5. The Lancet Editorial. India under COVID-19 lock down. 395(10233):1315. Available: [https://www.thelancet.com/journals/lancet/article/PIIS0140-6736\(20\)30938-7/fulltext](https://www.thelancet.com/journals/lancet/article/PIIS0140-6736(20)30938-7/fulltext)
6. Mohanty SK. Contextualizing geographical vulnerability to COVID-19 in India. *Lancet Glob. Health*. 2020;8(9):1104-10105.
7. Golechha M. COVID-19, India, lockdown and psychological challenges: what next?. *Int. J. Soc. Psych*. 2020;66(8):830-832.
8. Lahariya C. Health and wellness centers to strengthen primary health care in India: Concept, progress and ways forward. *Indian J Ped*. 2020;87:916-929.
9. Fang L, Karakiulakis G, Roth M. Are patients with hypertension and diabetes mellitus at increased risk for COVID-19 infection? *Lancet Respir Med*. 2020;8(4):e2. Available:[https://www.thelancet.com/journals/lanres/article/PIIS2213-2600\(20\)30116-8/fulltext](https://www.thelancet.com/journals/lanres/article/PIIS2213-2600(20)30116-8/fulltext).
10. Leung C. Clinical features of deaths in the novel coronavirus epidemic in China. *Rev Med Virol*. 2020;e1262-3. Available:<https://onlinelibrary.wiley.com/doi/full/10.1002/rmv.2103>
11. The Best Global Responses to the COVID-19 Pandemic, 1 Year Later. Available:<https://time.com/5851633/best-global-responses-COVID-19/>
12. Chowdhury AZ, Jomo KS. Responding to the COVID-19 pandemic in developing countries: Lessons from selected countries of the global South. *Development*. 2020;63:162-171. Available:<https://doi.org/10.1057/s41301-020-00256-y>.
13. Tabari P, Amini M, Moghadami M, Moosavi M. International public health responses to COVID-19 outbreak: A rapid review. *Iran J Med Sci*. 2020;45(3):157-169. DOI: 10.30476/ijms.2020.85810.1537
14. World Health Organization. Naming the coronavirus (COVID-19) and the virus that causes it; 2020. Available:[https://www.who.int/emergencies/diseases/novel-coronavirus-2019/technical-guidance/naming-the-coronavirus-disease-\(covid-2019\)-and-the-virus-that-causes-it](https://www.who.int/emergencies/diseases/novel-coronavirus-2019/technical-guidance/naming-the-coronavirus-disease-(covid-2019)-and-the-virus-that-causes-it).
15. Nayar PK. The long walk: Migrant workers and extreme mobility in the age of corona. *J Extreme Anthropol*. 2020;4:E1-6.
16. Ranscombe P. Rural areas at risk during COVID-19 pandemic. *Lancet Infect Dis*. 2020;20(5):545.
17. Chakraborty I, Maity P. COVID-19 outbreak: Migration, effects on society, global environment and prevention. *Sci Total Environ*. 2020;1(728):138882.
18. Jha AK, Jha R. India's responses to COVID-19 crisis. *Indian Econ J*. 2020;68(3):341-351.
19. Agoramoorthy G, Shieh P. Controlling the COVID-19: a successful model from a small island. *Interciencia*. 2020;45(4): 174.
20. Agarwal A, Nagi N, Chatterjee P, Sarkar S, Mourya D, Sahay RR, Bhatia R. Guidance for building a dedicated health facility to contain the spread of the 2019 novel coronavirus outbreak. *Indian J. Med Res*. 2020;151:177-183.
21. Subramani MV, Roman J. The corona responses in India-world's largest lockdown. *American Journal of the Medical Sciences*. (in press); 2020.
22. MoHFW. Containment plan: Novel coronavirus disease 2019, ministry of health and family welfare, government of India. 2020;1-18. Available:<https://ncdc.gov.in/showfile.php?id=528https://www.mohfw.gov.in/pdf/containmentplan16052020.pdf>
23. Statista. Coronavirus (COVID-19) test numbers across India. [updated 2020 Dec 10; cited 2020 Dec 17]. Available:<https://www.statista.com/statistics/1111063/india-coronavirus-COVID-19-testing-pre-million-by-state/>

24. Worldometer COVID-19 pandemic. Available:<https://www.worldometers.info/coronavirus/?app=mysection&order=17&subOrder=0&totalCount=17>
25. Taneja A, Khalil S, Raina A. Strengthening India's public health system is the need of the hour. Available:<https://thewire.in/health/watch-strengthening-indias-public-health-system-is-the-need-of-the-hour>.
26. Global Health Security Index. GHS Index Country Profile for India; 2019. Available:<https://www.ghsindex.org/country/india/>
27. World Health Organization. Domestic general government health expenditure (% of GDP); 2018. Available:<http://data.worldbank.org/indicator/SH.XPD.GHED.GD.ZS>
28. Ministry of Health and Family Welfare. National health profile 2019. Central Bureau of Health Intelligence. Government of India; 2020.
29. Karan A, Negandhi H, Nair R, Sharma A, Tiwari R, Zodpey S. Size, composition and distribution of human resource for health in India: new estimates using national sample survey and registry data. *BMJ Open*. 2019;9:e025979.
30. World Health Organization. The health workforce in India; 2016. Available:https://www.who.int/hrh/resources/16058health_workforce_India.pdf
31. National sample survey organization. Health in India-NSS 75th round, Ministry of Statistics and Program Implementation. Government of India. New Delhi; 2020.
32. Ministry of health and family welfare. National health accounts estimates 2016-17, Government of India. New Delhi; 2019.
33. Sriram S, Khan MM. Effect of health insurance program for the poor on out-of-pocket inpatient care cost in India: Evidence from a nationally representative cross-sectional survey. *BMC Health Serv Res*. 2020;20:839. Available:<https://doi.org/10.1186/s12913-020-05692-7>
34. Chalasani M, Nasir K, Gupta MD, Kalra A. The COVID-19 pandemic and India's cardiovascular disease burden: Finding the right balance. *Indian J Medical Ethics*. 2020;5(3):199-201.
35. Shukla A. What lessons does the COVID-19 pandemic hold for India's health system? 2020. Available:<https://scroll.in/article/962794/what-lessons-does-the-COVID-19-pandemic-hold-for-indias-health-system>
36. Gupta D, Biswas D, Kabiraj P. COVID-19 outbreak and urban dynamics: regional variation in India. *Geo Journal*; 2021. Available:[Http://doi.org/10.1007/s10708-021-10394-6](http://doi.org/10.1007/s10708-021-10394-6)
37. Ministry of health and family welfare. National Health Mission- Framework for implementation. Government of India. New Delhi; 2013.
38. Acharya R, Porwal A. A vulnerability index for the management of and response to the COVID-19 epidemic in India: an ecological study. *Lancet Glob. Health*. 2020;8(9). Available:[https://www.thelancet.com/journals/langlo/article/PIIS2214-109X\(20\)30300-4/fulltext](https://www.thelancet.com/journals/langlo/article/PIIS2214-109X(20)30300-4/fulltext)
39. Nair KS. Health workforce in India: Opportunities and challenges. *Int J Community Med Public Health*. 2019;6:4596-604.
40. Niti Ayog. Healthy states progressive India-report on the ranks of states and union territories. Government of India. New Delhi; 2019.
41. Wu Z, McGoogan JM. Characteristics of and important lessons from the coronavirus disease 2019 (COVID-19) outbreak in China: Summary of a report of 72314 cases from the Chinese centre for disease control and prevention. *JAMA*. 2020;323:1239-1242.
42. Guan W, Ni Z, Hu Y, et al. Clinical characteristics of coronavirus disease 2019 in China. *N Engl J Med*. 2020;382:1708-1720.
43. Vijayaraghavan BKT, Myatra SN, Mathew M, Lodhi N, Divatia JV et al. Challenges in the delivery of critical care in India during the COVID-19 pandemic. *J Inten Care Soc*. 2020;0(0):1-7.
44. Ministry of Health and Family Welfare. Updates on COVID-19. [updated 2020 Jun 28; cited 2020 Nov 6]. Available:<https://content.pib.iostechtools.com/1634928/web.html>.
45. Phua J, Faruq OM, Kulkarni AP, et al. Critical care bed capacity in Asian countries and regions. *Crit Care Med*. 2020;48:654-662.

46. Kapoor G, Sriram A, Joshi J, Nandi A, Laxminarayan R. COVID-19 in India: State-wise estimates of current hospital beds, intensive care unit (ICU) beds and ventilators. Center for Disease Dynamics, Economics and Policy; 2020. [Published 2020 April 20; cited Dec 21]. Available:https://cddep.org/wp-content/uploads/2020/04/State-wise-estimates-of-current-beds-and-ventilators_24Apr2020.pdf
47. Saigal S, Sharma JP, Pakhare A, et al. Mapping the characteristics of critical care facilities: Assessment, distribution, and level of critical care facilities from central India. Indian J Crit Care Med. 2017;21:625–633.
48. Basu S. Non-communicable disease management in vulnerable patients during COVID-19. Indian J of Med Ethics. 2020;5(2):103-105.
49. Chatterjee P. Is India missing -19 deaths? The Lancet. 2020;396(10252):657. Available:[https://www.thelancet.com/journals/lancet/article/PIIS0140-6736\(20\)31857-2/fulltext](https://www.thelancet.com/journals/lancet/article/PIIS0140-6736(20)31857-2/fulltext).
50. Hebbar PB, Sudha A, Dsoouza V, Chilgod L, Amin A. Health care delivery in India amid the COVID-19 pandemic: Challenges and opportunities. J Med Ethics. 2020;5(3):215-218.
51. National Sample Survey Organization. Health in India- NSS 71st round. Ministry of Statistics and Program Implementation. Government of India; 2016.
52. Thiagarajan K. COVID-19 exposes the high cost of India's reliance on private healthcare. BMJ. 2020;370. Available:<https://doi.org/10.1136/bmj.m3506>
53. Government of India. National health policy 2017. New Delhi: Ministry of Health and Family Welfare, Government of India; 2017.
54. Huston P, Campbell J, Russell G, Smith FG, Phillips RL, Weel CV et al. COVID-19 and primary care in six countries. BJGP Opne. 2020;4(4). DOI: 10.3399/bjgpopen20X101128
55. Prado NMB, Rossi TRA, Cheven SCL, Barros SG, Magno L, Santos HPC. The international response of primary health care to COVID-19: Document analysis in selected countries. Cad. Saude Publica. 2020;36(12): e00183820. DOI: 10.1590/0102-311x00183820
56. Makwana N. Public health care system's preparedness to combat epidemics after natural disasters. J Family Med Prim Care. 2020;9:5107-12.
57. Bharali I, Kumar P, Selvaraj S. How well is India responding to COVID-19? 2020. Available <https://www.brookings.edu/blog/future-development/2020/07/02/how-well-is-india-responding-to-covid19/#:~:text=India's%20response%20is%20consistent%20with,57th%20out%20of%20195%20countries>.
58. Haque A. The COVID-19 pandemic and the public health challenges in Bangladesh: A commentary. J Health Res. 2020;34(6):563-67.
59. Abideen AZ, Mohamad FB, Hassan MR. Mitigation strategies to fight the COVID-19 pandemic—present, future and beyond. J Health Res. 2020;34(6):563-67.

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