

Review Article

Unified by COVID-19 : Healthcare Lessons Learned from USA, China and India

Mitali Sengupta¹, Arijit Roy², S B Raha³, Satyajit Chakrabarti⁴, Indraneel Mukhopadhyay⁵

Healthcare disparities and delivery system limitations create health inequities. They constantly challenge the conventional healthcare models across the globe. With the healthcare fallouts surrounding the recent COVID-19 pandemic, most countries worldwide have borne the brunt.

To understand the healthcare policies and practices in the light of COVID-19 situation, three countries representing high income, upper middle and lower middle income as per World Bank classification have been studied and their fiscal reforms, policy changes and effective response strategies are analyzed.

Though the healthcare economics of USA, China and India are distinct and divergent, yet the issues and challenges surrounding health and sociological perspectives have significant common ground for further analysis. This paper plausibly analyzes the existing healthcare expenditure, policies and practices of USA, China and India in combating COVID-19 pandemic.

While it is impossible to design a single global comprehensive model to cater to the whole world, collaborative efforts would lead to enhanced resources utilization in public health efforts, revamping economy, care of the vulnerable, regional and global cooperation to fight the menace of not only the current pandemic but also in future.

[J Indian Med Assoc 2021; 119(9): 39-46]

Key words : Healthcare, Expenditure, COVID- 19 pandemic, USA, China, India.

Health and wellbeing are the key pillars of a sustainable nation. There is a strong relationship between health and social development. Poor health is a concomitant force for under-development and poverty¹.

The healthcare inequities are diverse, multi-factorial and complex that challenge healthcare personnel, policymakers and experts. Common factors include healthcare accessibility issues, physician scarcity, treatment modalities and outcome disparities across varied community settings². These differences are largely due to key drivers associated with healthcare costs, access and availability of healthcare services. The situation is aggravated by catastrophic Out Of Pocket (OOP) expenditure and limited availability of emergency services³.

Current challenges surrounding COVID-19 has unified the entire world. Every country irrespective of

Editor's Comment :

- Healthcare is a multifactorial, complex process involving financial, technical, administrative and geopolitical factors which varies across countries and their economical capacities.
- COVID-19 pandemic unified nations and tested the health capacities of USA, India and China across different parameters.
- Urgent Need to relook and shape public health policies, infrastructure and capital inflow into healthcare.
- Learning from the past and implementing for the future. Convergence of technical know-how, local and global cooperation, sustaining economy and preparing for resurgent future.

its financial power or demography is fighting against COVID-19 pandemic. International lockdown and sealing of national borders have been in place to curb this global menace. Every nation is working with their knowledge, resources and experience to deal with the situation, yet the trend of positive cases is on the rise and mortality ratios have increased manifold. One major limitation is the inability of conventional vaccines to specifically treat COVID-19. A few vaccines have been developed recently after clinical trials though their efficacy is under review⁴.

This paper has attempted to address the healthcare dynamics in the following manner. The initial sections highlight the conventional healthcare policies and practices of the three representative countries - USA, China and India belonging to high income, upper middle

¹MSc, PGDBA, Assistant Professor, University of Engineering & Management, Kolkata 700160

²MBBS, DCP, DNB, DMLE, Consultant Pathologist, Chikitsa Medicare Centre Pvt Ltd, Kolkata 700034 and Corresponding Author

³MBBS, DCP, Medical Officer, Pathologist, LDV Hospital, Kolkata 700009

⁴PhD, Chancellor, University of Engineering & Management, Kolkata 700160

⁵PhD, Professor, Institute of Engineering & Management, Kolkata 700091

Received on : 05/02/2021

Accepted on : 28/07/2021

and lower middle income nations⁶. The health practices and COVID-19 associated expenditure have been analyzed and strategies for possible mitigation of such crises in future have also been recommended.

Healthcare expenditure, Policies and Practices- USA, China and India :

The healthcare policies and practices are unique and tailored for the population they serve. A brief discussion of each is as follows. Table 1 highlights the healthcare statistics for the different countries.

USA

The US healthcare system follow a mixed approach with approximately 92% of population having some coverage and nearly 8% without any insurance (2019)⁶. Apart from Medicare and Medicaid, employer sponsored insurance also cover a significant proportion and two third of Medicaid beneficiaries are part of organizations with managed care⁷. The Affordable Care Act (2010) has seen significant Government financing in healthcare with enhanced coverage worth 20 million⁸. Public spending, in 2017, have accounted for 45% of healthcare spending with 8% GDP and about 28% is represented by federal spending. Children Health Insurance Programs (CHIP) are funded by federal government to states and many states charge premiums for the same⁹.

In 2019, private healthcare insurance accounted for about one third of total healthcare expenditure. Approximately 68% of Americans had private health insurance while 34.1% had public health insurance⁶. Majority of this is employer sponsored (55.4%) while a minor population (11%) opted for profit or non-profit providers. It has been reported that the healthcare costs borne by regular households is similar in proportion to that of the Federal Government (2018:28%). 10% of the total healthcare expenditure

is Out Of Pocket (OOP), approximately 40% is invested towards dental care and about 14% on medicines¹⁰.

An important feature of the US healthcare system is the provision to obtain care during emergency where hospitals are required to provide treatment irrespective of their paying capabilities or insurance status, race and/or origin. Eventually, a lot of expense in healthcare is borne by private health establishments that remain uncompensated or turn charitable.

CHINA

The Chinese healthcare reforms aimed to establish universal healthcare system that is safe, convenient, effective and affordable for everyone. The basic medical insurance system covers about 95% of the total Chinese population. The national healthcare security administration was established in 2018 for managing different medical insurance programs¹¹. China spent 6.6% GDP on healthcare, 28% financed by local and Central Government, 44% public or private insurance and social donations and 28% is financed through Out Of Pocket (OOP)¹².

The healthcare costs and associated payments are linked to different insurance types that are owned by the patients. Those, that have other corporate medical insurance or commercial plans, the bill amount paid by the patients normally vary as per the coverage of the healthcare options within their medical insurance. For rural and urban areas, any catastrophic healthcare expenditure that cannot be borne by individuals through insurance or Out Of Pocket (OOP) are partly covered by social donations and local government.

Another novel initiative 'Healthy China 2030 plan' aims to deal with conventional diseases and accessibility issues for ageing population¹³. This plan emphasized on lifestyle improvement, health service options and sustainable growth of health industry with doorstep healthcare delivery provisions by year 2020.

INDIA

The Indian constitution obliges 'Right to health' for every citizen. Being a part of universal healthcare coverage, Government health services are free. Unfortunately, the public hospitals across the country are severely underfunded. Numerous healthcare programs in the past attempted to reduce this burden of catastrophic health expenditure, especially for people belonging to

Table 1 — Health Care expenditure of USA, China and India

Population and health care statistics of USA, China and India			
	USA	China	India
Total population (2018)	327,167,434	1,393,000,000	1,325,000,000
Gross national income per capita (PPP international \$, 2018)	63,690	18,170	7,680
Life expectancy at birth total (years, 2017)	78.539	76.47	69.165
Current health expenditure per capita, PPP (current international \$) (2017)	10,246.139	841.115	253.322
Current health expenditure (% of GDP)(2017)	17.061	5.151	3.535
Domestic general government health expenditure (% of current health expenditure) (2017)	50.158	56.673	27.132

(Source : <https://data.worldbank.org>)

lower socio-income groups thus addressing their vulnerable situation. The Rastriya Swastha Bima Yojna (RSBY) in 2008 that subsumed to Pradhan Mantri Jan Arogya Yojna (PMJAY) covered only 40% of people who are economically downtrodden and later extended to mine and plantation workers¹⁴. Apart from Central Government Health Scheme (CGHS) the Employee State Insurance Scheme (ESI) is the only scheme where both employers and employees contribute towards health insurance. The Out Of Pocket (OOP) expenditure, thus, remained considerably significant.

The Ministry of Health and Family Welfare (MOHFW) with Federal ministry Established Ayurveda, Yoga and Naturopathy, Unani, Siddha and Homeopathy (AYUSH) in 2014 as an alternative practice for delivery. Since, the healthcare GDP contribution is merely 1.28% on healthcare facilities, which is significantly lower than USA (17.07%) and China (4.98%), quality healthcare for all is a distant dream¹⁵. Only a handful of population has private insurance and low public health expenditure facilitates a higher number of non-insured people. They bear expenditure at the cost of household expenses whenever needed thereby severely affecting the standard of living.

COVID-19 infections and healthcare response :

Public healthcare financing varies across nations. The onset of COVID-19 dismantled the existing healthcare machinery and created an urgent need to rethink and redesign conventional protocols and strategies. Most importantly, it was clear that COVID-19 pandemic could not be insulated by proportionate increase in healthcare expenditure¹⁶.

USA

In USA, the Government was initially reluctant with fewer restrictions. Since wearing mask, social distancing and dissemination of public information was slow, it created disarray and misinformation amongst people. The jingoist nationalism further termed the virus as "Chinese made" that blocked trade relations and technical collaborations though the actual implication of the pandemic couldn't be assessed at this stage.

Preliminarily, in response to COVID-19 outbreak, inconsistent travel bans were introduced by allowing travel from Europe while banning those from China¹⁷. The fiscal reforms initiated by the US Government involved massive financing through various acts like Paycheck Protection Program and Healthcare Enhancement Act, Coronavirus Aid, Relief and Economic Security Act, Coronavirus Preparedness and Response Supplemental Appropriations Act and

Families First Coronavirus Response Act¹⁸. These provisions covered paid sick leaves, food and unemployment benefits for the affected healthcare personnel. It also assured International financial assistance and coverage for student loans.

CHINA

China was the epicenter of COVID-19 and incurred multidimensional losses especially in finance, infrastructure, emergency response, healthcare. Morbidity and mortality figures were highest between 31st December 2019 and 29th February 2020, however the daily incidence was less than other Nations¹⁹. COVID-19 outbreak led to immediate containment of cities, strict lockdown, ceasing large scale mobility, stringent testing protocols, social distancing and mandatory two-week quarantine²⁰.

Rapid dissemination of correct health information through electronic, print and local social media made people well versed with hygiene protocols, mask usage and disinfection. They were also encouraged to self-report infections. Free COVID-19 testing, monitoring of pricing for essential commodities including food and channelization of resources through Non-government and Charitable Institutions helped to a great extent¹⁷. Fiscal reforms included announcement of estimated RMB 2.6 trillion (2.5% of GDP), out of which approximately 50% of the promised amount has already been implemented¹⁸.

In response to COVID-19, China initiated key strategic decisions. Increased spending on epidemic control and prevention, upscaling of medical equipment production, accelerated disbursement of unemployment insurance with inclusion of migrant workers, relieve from taxation and waiving of social security obligations were initiated.

INDIA

With a daily upsurge of active cases and rapid increase in death figures, the Indian economy suffered a terrible demand shock in the wake of COVID-19 pandemic. The Government immediately restricted travel, movements and invoked the Epidemic Disease Act. Like China, lessons of social distancing, hand hygiene, contact tracing, quarantine and surveillance was enforced. Aarogya Setu app was launched by government to dispense health related information, compliance and regulate contact tracing of infected people. Another positive outcome was the rapid establishment of viral molecular testing protocols such as Reverse Transcriptase-Polymerase Chain Reaction (RT-PCR), Cartridge Based Nucleic Acid Amplification Test (CBNAAT) etc. Additionally, rapid approval from

regulatory authorities like NABL were also solicited.

Teleconsultations formed the backbone of communication reducing the rural-urban divide. To encourage the same, Indian Council of Medical Research (ICMR) has issued updated rules and guidelines for teleconsultations with periodic amendments as per needs²¹.

The fiscal measures announced by the Government included a stimulus package valued at 0.85% of the GDP¹⁸. The prime elements were food, cooking gas and cash transfers to underprivileged, insurance coverage for healthcare personnel, wage support to low wage workers and in many cases, easing the criteria for receiving unemployment benefits. Previously, the government had announced 150 billion rupees (approximately 0.1% of GDP), for enhancing healthcare infrastructure that included strengthening of COVID-19 testing facilities, provision for PPE, supply of isolation beds, ventilators and increase ICU facilities across healthcare institutions²².

CONCLUSION

The emergence of COVID-19 has severely affected countries and their economies. Healthcare policies and preferences of USA, China and India are being tested for their resilience and capacity to withstand maximum possible turmoil. It has broken the classical myth regarding healthcare investment that wealth alone cannot be the only solution to restore the country from COVID-19 pandemic. Adversity being a powerful teacher, there is an urgent need to relook and shape public health policies, infuse capital flow in protecting lives and livelihood, amendment of allocation guidelines towards healthcare infrastructure for enhanced production of PPE, ICU beds and ventilators.

The variation in sizes, healthcare policies and overall preparedness of these three countries is broad remainder that 'one size does not fit all', yet there is a need to identify common goals, fallacies and equitable participation in specific areas. This unification of nations aided by a pandemic has grossly revealed our common inadequacies despite having segregations in the economic forefront.

Our study is a concerted effort to understand the approaches of these three representative economies-USA, China, India and their COVID -19 pandemic response. In our analysis we have put forward certain mitigation strategies, based on mutual cooperation and greater need to identify common goals and resolve other insufficiencies.

POSSIBLE MITIGATION STRATEGIES

Care of the vulnerable population :

COVID-19 has displaced the native local population, migrant workers and also the refugees that took shelter in other countries. In India, there is a huge population of migrant laborers who were left stranded, bereft of transportation, food provisions and livelihood. Similar incidents have also been echoed across China and African Nations.

In presence of economic and social disparities, differentiation based on urban and rural population should not be encouraged. As learnt from previous epidemics of Ebola and H1N1 influenza, the combination of resource diversion, shortage of medical supplies, closure of health facilities and lack of trained medical staff overwhelmed the various operational health systems across these nations, overburdening them more so in humanitarian context²³. Such restrictions can further, exacerbate resource distribution between rural, urban and other informal settlements. Additionally, people with comorbid conditions such as cardiovascular diseases, diabetes, tuberculosis and HIV infections are at increased risk of complications and death²³. Special attention, must be paid to pregnant mothers, children, elderly and immunocompromised people.

Protection and workplace safety of frontline healthcare workers is paramount. Unforeseen stress, long working hours and lack of vital essentials like PPE and other items have resulted in depression, burnout, insomnia and Post-Traumatic Stress Disorder (PTSD) amongst frontline healthcare workers. They also faced other psycho-social issues like increased risk of infection, quarantine, isolation, social distancing, negative societal vibes like stigma, depersonalization and lack of support from co-workers and organizations along with financial stress which further elevated role conflict²⁴. Early detection, risk communication, effective containment strategies and multinational collaboration where found to be effective during the 2009 H1N1 pandemic and needs to be replicated during the present crisis.

Surveillance activity concerning local, marginalized and displaced population needs to be balanced with public health measures, outbreak readiness, social distancing, crowd management, increased testing facilities and access to hospitals with adequate beds and ICU support. As quarantine is challenging, efforts must be made to ensure basic needs, food security and supportive services are maintained. Respective Governments, Private Sectors and Non-government

organizations, must act together to ensure a coordinated system of information sharing, data analysis, surveillance and effective roll out of measures in order to ensure protection and sustainability of vulnerable population.

Enhanced Resources in public health efforts :

While humanity braced itself against the deadly COVID-19 infection, an important question still remains unanswered: What have we learnt from previous pandemics and how well are we prepared to respond and effectively control disease spread? The answer(s) sadly remain ensconced within pages of voluminous texts, published articles and workshop summaries.

An important observation noted during COVID-19 outbreak is that developed economies having better health facilities had higher mortalities. Also other underlying comorbid conditions and lifestyle diseases contributed towards poor recovery outcomes.

Higher infectivity and transmission rates were reported across the nations, especially from the urban population with higher percentage of positive cases. Different factors like poorly designed policies, lack of political willingness, non-judicious resource management, significant chronic diseases and limited implementations are believed to be contributory towards the pandemic²⁵. However, this time, public health and community stakes have ensured that implementation of some previous suggestions are carried out.

Early detection of outbreak focused on integration of existing knowledge and strengthening of private, public and non-government participation. As this study involve countries with large population sizes, stakeholders need to approve effective, efficient and sustainable approaches keeping in mind their national capacities and existing legal framework.

In this digital era, an effective unbiased local and global coordinated system of information and data analysis will dramatically enhance the ability to contain microbial threats. A slew of epidemiological data and evidence based material on COVID-19 and multiple mathematical models and predictive analytics have kept researchers busy. While they are paramount, the actual exercise would be to get them validated and benchmarked in public health domain. The onus is to get a working predictive model as per requirement²⁶.

Regional and Global Cooperation :

To promote regional and global cooperation, 'whole of Government – whole of society' approach has been adopted but it lacks International response. Disparities in practices to contain COVID-19 pandemic are visible

in adoption of containment and lock down measures across different countries.

Regional and International cooperation is absolute towards establishment of an intelligent healthcare system based upon outcome, enhanced production capabilities, planning, forecasting and decision analysis of infectious diseases that will control future pandemics.

Current response to COVID-19 pandemic has clearly pointed out the difficulties amongst various nations. In the absence of sufficient cooperation, there were equipment poaching, export bans, travel restrictions and bidding wars. Several countries have pursued independent research programs in an attempt to polarize vaccine production and promote 'Vaccine Nationalism' Policy²⁷. Insufficient economic cooperation also ensured that poorer nations were mainly left to fend for themselves. Populist nationalism amongst countries have made the attitude of 'My Country First' become a global movement with 'America First' 'China First' and 'India First' initiatives²⁷. Such initiatives have undermined the overall willingness to cooperate with other countries thereby restricting the responses to deal with COVID-19 pandemic on a global scale.

Revamping economy and stabilizing financial markets :

Living through the most challenging times, we are forced to think about several basic questions- How to save lives and livelihood? What financial decisions should be taken by Governments? How to evaluate the risks associated with prolonged lockdown? How to maintain income security, food supplies, save financial institutions and safeguard the future generations and perhaps to find the best possible directions?

The answers to all these questions require integration of ideas and thoughts, financial experts, Government and policy makers; which is outside the purview of this paper. We however endeavor to seek a mutual platform to reduce the financial baggage in this pandemic.

With the rapid onset of COVID-19, protecting the livelihoods of people is the foremost challenge. Supporting the hardest hit, ie, informal workers, laborers in India, the working class population of China, single mothers, nurses and Asian Americans in USA has been challenging till date. Leaders and Government alike should determine the level of support that each population segment requires and ensure appropriate channels of distribution.

Income support and conditional cash programs like PMJDY, MNRGA in Indian context shall support millions²⁸. Also the ambit of coverage needs to be broadened and should be inclusive of pregnant mothers, child laborers, homeless and the elderly. Digitized payments through consolidation of databases could be helpful.

Post COVID, monetary expansion will be required to salvage industrial production, infusion of funds and growth of stock market. In this regard, the role of Central Banks and other financial policy making bodies will be crucial in determining the best possible strategies and long-term successes. USA and China with their deeper capital markets can secure loans. They can use their financial strength and institutional investors to reduce the pressure on public finance. In India, stimulus package has been flagged off to restore financial balance and accelerate recovery. However, since the different Indian States have variable geographical size, percentage of infected people and urban-rural differences, it requires tailor-made policies as per need²⁹.

Better funding and enhanced healthcare infrastructure strategies are being worked out at the government and local level¹⁷. Governments may also relax their taxation and other regulatory regimes to help businesses and their growth. Sectors such as food, agriculture, housing, power will require credit backstops, bankruptcy protection and liquidity support.

Digitization is the new mantra. China, already known as a globally acclaimed digital leader before COVID-19 happened, is facing competition from US and India who are catching up fast. In a traditional economy, areas of physical interactions are rapidly transiting to the digital mode and has accelerated both Business to Business (B2B) and Business to Customer (B2C) application channels. While Indian Government has already given a mandate in terms of augmenting digital platforms through increased use of wallet payments, online banking and electronic transfer of funds and monetary benefits given to the poorest of the poor, limited technical knowhow will continue to promote fear and reluctance amongst users.

Different countries hit by pandemic have witnessed growth fluctuations, certain industries like aviation, tourism and hospitality have been dealt with a body blow. Positive growth figures were witnessed in pharmaceuticals, biotech, healthcare supplies medical technologies, consumer durables and utilities. Emergence of telemedicine, education technology, elderly care has already made headlines across different countries. The role of private sector and

technology companies have become more significant with regard to their socio-economic contributions and emergence of powerful institutions that have donated millions to recovery efforts.

As is the case with Chinese economy, two thirds of its revenue have come from private sector. In case of India, recommendations of a robust Private Public Partnership (PPP) and legislations to provide strong legal and procedural support have come from various stakeholders.

The pandemic is a global tragedy and it is the right time to introduce inclusive economic reforms concerning fiscal, labor, environmental and social contexts. While digitalization, supply chain management, e-retailing will lead the way, global and national agenda driven by the principles of diminishing inequality, reducing poverty, protecting environment by ensuring financial inclusiveness and provision of better and more efficient public and social services needs to be figured out urgently by Governments, companies and Social Organizations.

Future Directions and the Road ahead

An important learning lesson from COVID highlighted the fact that mere investment in healthcare does not suffice all dimensions. Sustainable and intelligent healthcare policies with a healthy lifestyle, may reduce the risk of disease and co-morbidity. In urban areas, there is ease of availability and accessibility of drugs, diagnostic tools and treatment protocols where as in rural areas, low population density and better environment quality reduce chances of disease transmission²⁵.

Teleconsultation has proved to be an effective tool for patients and physicians alike³⁰. During COVID-19, telemedicine along with other various specialties like tele-ophthalmology, tele radiology has helped in providing treatment to patients located in varied geographical areas. This has diminished the burden on hospitals and reduced patient exposure to the virus. The scope and regulations of teleconsultation are exhaustive and are undergoing amendments as per the needs of changing scenario.

The response to COVID-19 pandemic has benefitted from the use of Artificial Intelligence (AI) and different mathematical models focusing on mitigation strategies keeping in mind the limited economic resources and socially disruptive factors. This has also helped in evaluating policies in a novel and rapidly evolving epidemiological circumstances²⁶. The use of data for forecasting and validating epidemiological changes coupled with their corresponding results should be available in public repositories for present and future

reference.

The emergence of newer treatment regimens for COVID-19 pandemic has enabled the convergence of applied sciences like biotechnology, immunology, virology to be synced with translational sciences and clinical research. Such an example was witnessed in the field of drug repurposing wherein existing antiviral, antimalarial and immunomodulatory drugs were used in treatment of COVID-19 pandemic³¹. The examples of Hydroxychloroquine and Ivermectin are relevant to the context. International cooperation for clinical trials across heterogeneous population shall be instrumental in understanding the pathophysiology of COVID-19.

Use of data sciences through standardizing and integrating demographic information coupled with DNA sequencing could be helpful but might need regulatory compliance to gain positive outcomes and maximum usage in public domain. The road ahead is essentially a 'federated learning' process in which telemedicine, novel AI techniques, biological and clinical research will ensure maximum therapeutic benefits for real world complex disease such as COVID-19.

Limitations :

The current study bears a few limitations. Firstly, it took into account the scenario and health policy details of USA, China and India as representative nations across different income levels. However, the practical healthcare challenges faced by different countries belonging to the same income level might not be different and thus all the recommendations may not yield optimal results. Secondly, this paper has considered data from authentic secondary sources. Detailed analysis considering primary empirical data might be beneficial to provide a holistic overview of the current pandemic challenges.

ACKNOWLEDGEMENTS

The authors would like to thank Dr S Gupta and Dr A Mondal for the constructive inputs and University of Engineering and Management, Kolkata for the necessary support and infrastructure.

Conflict of interest : NIL

Acronyms Used —

RT-PCR : Reverse Transcriptase Polymerase chain reaction

CBNAAT: Cartridge- based nucleic acid amplification test

NABL: National Accreditation Board for Testing and Calibration Laboratories

PPE: Personal Protective Equipment

ICU: Intensive care unit

PMJDY: Pradhan Mantri Jan-DhanYojana

MNREGA: Mahatma Gandhi National Rural

Employment Guarantee Act

GDP: Gross domestic product

B2B: Business to business

B2C: Business to Customer

REFERENCES

- Mishra CP — Nexus of poverty, energy balance and health. *Indian journal of community medicine: official publication of Indian Association of Preventive & Social Medicine* 2012; **37(2)**: 71. PMID: 22654278, DOI: 10.4103/0970-0218.96083
- Sharma A, Ladd E, Unnikrishnan MK — Healthcare inequity and physician scarcity: empowering non-physician healthcare. *Economic and political weekly* 2013; **30**: 112-7. Available from: <http://www.jstor.org/stable/23391472>
- Prinja S, Kaur M, Kumar R — Universal health insurance in India: ensuring equity, efficiency, and quality. *Indian journal of community medicine: official publication of Indian Association of Preventive & Social Medicine* 2012; **37(3)**: 142. PMID:23112438, DOI: 10.4103/0970-0218.99907
- Knoll MD, Wonodi C — Oxford–AstraZeneca COVID-19 vaccine efficacy. *The Lancet* 2021; **397(10269)**: 72-4. PMID: 33306990, DOI: 10.1016/S0140-6736(20)32623-4
- World Bank Country and Lending Groups. Available from: <https://datahelpdesk.worldbank.org/knowledgebase/articles/906519-world-bank-country-and-lending-groups> [Last accessed on 2021 July 12]
- Keisler-Starkey K, Bunch LN — Health insurance coverage in the United States: 2019. Washington, DC: US Census Bureau. 2020 Sep. Available from: <https://www.census.gov/library/publications/2020/demo/p60-271.html>[Last accessed on 2021 July 12]
- Kaiser Family Foundation. State Health Facts – Medicaid Managed Care State-Level Enrolment Data. Available from: <https://www.kff.org/data-collection/medicaid-managed-care-market-tracker/>. [Last accessed on 2021 July 12]
- Collins SR, Bhupal HK, Doty MM — Health insurance coverage eight years after the ACA: fewer uninsured Americans and shorter coverage gaps, but more underinsured. *Commonwealth Fund*. 2019 Feb 7;7. Available from: https://www.commonwealthfund.org/sites/default/files/2019-08/Collins_hlt_ins_coverage_8_years_after_ACA_2018_biennial_survey_sb_v2.pdf [Last accessed on 2021 July 12]
- Commonwealth Fund. 2020. Available from:https://www.commonwealthfund.org/sites/default/files/documents/___media_files_publications_fund_report_2017_may_mossialos_intl_profiles_v5.pdf. [Last accessed on 2021 July 12].
- Organization for Economic Co-operation and Development, Out-of-Pocket Spending: Access to Care and Financial Protection. Available from:<https://www.oecd.org/health/health-systems/OECD-Focus-on-Out-of-Pocket-Spending-April-2019.pdf>[Last accessed on 2021 July 12].
- World Health Organization — Health financing. Available from: <https://www.who.int/china/health-topics/health-financing>. [Last accessed on 2021 July 12].
- Fang H — President, The Commonwealth Fund. Available from: <https://www.commonwealthfund.org/international-health-policy-center/countries/china> [Last accessed on 2021

- May 30]
- 13 Fu W, Zhao S, Zhang Y, Chai P, Goss J — Research in health policy making in China: out-of-pocket payments in Healthy China 2030. *BMJ* 2018; 360. PMID: 29437565, doi: 10.1136/bmj.k234
 - 14 Angell BJ, Prinja S, Gupta A, Jha V, Jan S — The Ayushman Bharat Pradhan Mantri Jan ArogyaYojana and the path to universal health coverage in India: Overcoming the challenges of stewardship and governance. *PLoS medicine* 2019; **16(3)**: e1002759. PMID: 30845199, doi: 10.1371/journal.pmed.1002759
 - 15 ABP News Bureau. Available from: <https://news.abplive.com/videos/news/india-only-spends-1-28-of-its-gdp-on-health-facilities-india-chahta-hai-1461346> [Last accessed on 2021 July 12]
 - 16 Khan JR, Awan N, Islam M, Muurlink O — Healthcare capacity, health expenditure, and civil society as predictors of COVID-19 case fatalities: A global analysis. *Frontiers in public health* 2020; **8**: 347. PMID: 32719765 DOI: 10.3389/fpubh.2020.00347
 - 17 Olufadewa II, Adesina MA, Ekpo MD, Akinloye SJ, Iyanda TO, Nwachukwu P, *et al* — Lessons from the coronavirus disease 2019 (COVID-19) pandemic response in China, Italy, and the US: a guide for Africa and low-and-middle-income countries. *Global Health Journal* 2021; **5(1)**: 56-61. PMID: 33585052DOI: 10.1016/j.glohj.2021.02.003.
 - 18 Policy responses to COVID-19. Available from: <https://www.imf.org/en/Topics/imf-and-covid19/Policy-Responses-to-COVID-19#U> [Last accessed on 2021 July 12]
 - 19 Lai CC, Wang CY, Wang YH, Hsueh SC, Ko WC, Hsueh PR— Global epidemiology of coronavirus disease 2019 (COVID-19): disease incidence, daily cumulative index, mortality, and their association with country healthcare resources and economic status. *International journal of antimicrobial agents* 2020; **55(4)**: 105946. PMID:32199877, DOI: 10.1016/j.ijantimicag.2020.105946
 - 20 Chen S, Yang J, Yang W, Wang C, Bärnighausen T — COVID-19 control in China during mass population movements at New Year. *The Lancet* 2020; **395(10226)**: 764-6. PMID: 32105609, DOI: 10.1016/S0140-6736(20)30421-9
 - 21 Khanna RC, Cicinelli MV, Gilbert SS, Honavar SG, Murthy GV — COVID-19 pandemic: Lessons learned and future directions. *Indian Journal of Ophthalmology* 2020; **68(5)**: 703. PMID: 32317432 DOI: 10.4103/ijo.IJO_843_20
 - 22 Kumar S, Reddy DC — Response to COVID-19 pandemic in India: How can we strengthen our response? *Indian Journal of Community Medicine: Official Publication of Indian Association of Preventive & Social Medicine*, 2020; **45(3)**: 251. PMID: 33353995 DOI: 10.4103/ijcm.IJCM_653_20
 - 23 San Lau L, Samari G, Moresky RT, Casey SE, Kachur SP, Roberts LF, *et al* — COVID-19 in humanitarian settings and lessons learned from past epidemics. *Nature Medicine* 2020; **26(5)**: 647-8. PMID: 32269357, DOI: 10.1038/s41591-020-0851-2.
 - 24 Gupta S, Sahoo S — Pandemic and mental health of the front-line healthcare workers: a review and implications in the Indian context amidst COVID-19. *General Psychiatry* 2020; **33(5)**: PMID: 34192235, DOI: 10.1136/gpsych-2020-100284
 - 25 Ahmed A, Haque T, Rahman MM — Lifestyle acquired immunity, decentralized intelligent infrastructures and revised healthcare expenditures may limit pandemic catastrophe: a lesson from COVID-19. *Frontiers in public health* 2020; **8**: 674. PMID: 33224915, DOI: 10.3389/fpubh.2020.566114
 - 26 James LP, Salomon JA, Buckee CO, Menzies NA — The use and misuse of mathematical modeling for infectious disease Policymaking: lessons for the COVID-19 pandemic. *Medical Decision Making* 2021; **41(4)**: 379-85. PMID:33535889, DOI: 10.1177/0272989X21990391
 - 27 Brown G, Susskind D — International cooperation during the COVID-19 pandemic. *Oxford Review of Economic Policy* 2020; **36(Supplement_1)**: S64-76. DOI: 10.1093/oxrep/gra025
 - 28 Gupta R, Madgavkar A — Getting ahead of coronavirus: Saving lives and livelihoods in India. McKinsey & Company Insights. 2020 Apr. Available from: <https://www.mckinsey.com/featured-insights/india/getting-ahead-of-coronavirus-saving-lives-and-livelihoods-in-india>[Last accessed on 2021 July 12]
 - 29 Choutagunta A, Manish GP, Rajagopalan S — Battling COVID 19 with dysfunctional federalism: lessons from India. *Southern Economic Journal* 2021; **87(4)**: 1267-99.PMID: 34230703, DOI: 10.1002/soej.12501
 - 30 Agarwal N, Jain P, Pathak R, Gupta R — Telemedicine in India: A tool for transforming health care in the era of COVID-19 pandemic. *Journal of education and health promotion* 2020; **9**. PMID: 32953916, DOI: 10.4103/jehp.jehp_472_20
 - 31 Zhou Y, Wang F, Tang J, Nussinov R, Cheng F — Artificial intelligence in COVID-19 drug repurposing. *The Lancet Digital Health* 2020 Sep 18. PMID: 32984792 DOI: 10.1016/S2589-7500(20)30192-8.