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Cost Benefit Analysis of COVID-19 Lockdown in India

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ABSTRACT

COVID-19 pandemic has jolted the entire world by infecting approximately 10 million and killing 0.5 million people worldwide till 25th June, 2020. India has reported 0.473 million infections and 14.89 thousand deaths till 25th June, 2020. We have witnessed the most widespread lockdown in the human history. The present study depicts an economic evaluation of COVID-19 lockdown (25th March to 25th June) in India. It is a Cost Benefit Analysis (CBA) encompassing an excel based decision tree model delineating the comparison of "lockdown intervention scenario" with "no lockdown scenario". We have incorporated only the medical treatment costs of COVID-19 that are estimated by using top to bottom cost calculation approach. The epidemiological forecasting methodology has been utilized for deciphering the COVID-19 Point Prevalence without lockdown. The actual Point Prevalence is collected from MOHFW data. Our analysis limns that the overall medical treatment cost of 47305 COVID-19 patients in India is approximately INR 79.1 Billion in the current scenario of lockdown which could have been INR 2.82 Trillion without lockdown as 84.7 million people would have been infected till 25th June. The nation-wide lockdown has helped India to save INR 2.74 Trillion of the medical treatment costs in the period of 25th March to 25th June 2020 on COVID-19 patients which is equal to 1.86% of Indian GDP measured by using Indian GDP of FY2019-20 at current prices as the basis of calculation.

Keywords: COVID-19, Economic Evaluation, Economic Impact, Point Prevalence, Epidemiology

INTRODUCTION

As per WHO [1], Corona Virus Disease (COVID)-19, has created problems across the globe by contracting millions and killing thousands. Approximately 10 million people have been infected and 0.5 million have been killed by COVID-19 worldwide [2] till 25th June 2020. India [3] has reported 0.473 million infections and 14.89 thousand deaths till 25th June 2020. The primary mode of transmission is person to person [4]. A close contact with the infected person is the major cause of transmission of infection, although the consensus on whether COVID-19 may also spread by the surfaces which has virus on it is yet to be achieved. Social distancing [5] has been considered as the main effective tool in controlling the transmission of virus. Most of the countries have enforced the lockdown to curb the spread of COVID-19. India enforced the nation-wide lockdown on 25th March 2020 which has been extended to 30th June in five phases by allowing some alleviation in every phase, first one being the strictest and fifth one being the

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least. The Oxford COVID-19 Government Response Tracker [6] has given a harshness of 100 to 1st phase of lockdown in India. This tracker is designed to systematically record government responses worldwide and aggregate the scores into a common 'Stringency Index' which we hope will help researchers, policymakers and citizens understand whether increasingly strict measures affect the rate of infection, and identify what causes governments to implement stricter or less strict measures.

The lockdown [7] has had a debilitating impact on Indian economy, "with the prolonged country wide lockdown, global economic downturn and associated disruption of demand and supply chains, the economy is likely to face a protracted period of slowdown".

The current study aims to delineate the cost benefit analysis of the COVID-19 lockdown in India in comparison to a non-lockdown scenario.

METHODOLOGY

Study Design

The current study utilizes an exploratory study design to delineate the economic evaluation of "Lockdown scenario" against "No lockdown scenario".

Model

The study encompasses the end node-based Decision Tree model. The model is developed in Office 365 MSO 32-bit version of Microsoft Excel.

Study type

The present study is a Cost Benefit Analysis where the costs and consequences are calculated in monetary terms. All the costs and benefits are depicted in Indian National Rupees (INR).

Perspective

The study encompasses a societal perspective of economic evaluation.

Intervention and Comparator

The study limns the comparison of "COVID-19 lockdown commencing from 25[th]March-25th June" against a "No lockdown scenario" for the same period.

Cost and Outcome

The Cost and outcomes are measured in monetary values. The study encompasses only the direct medical costs on the Indian health system/patients which includes the following: OPD treatment cost, IPD costs, ICU costs without mechanical ventilating, ICU costs with mechanical ventilating by encompassing Length of stay, quarantine costs, cost of COVID-19 testing, and cost of medicines. All the cost and consequence data are taken from the secondary literature review. Targeted Literature Review (TLR) methodology is used to decipher various data

points. Different TLRs are conducted for different variables. The PICOS (Population, Intervention, Comparator, Outcome and Study design) criteria are decided based on the variable of search.

Model Approach

The actual Point Prevalence of COVID-19 is collected from Ministry of Health and Family Welfare (MOHFW) data. The epidemiological forecasting methodology is used to decipher the Point Prevalence of COVID-19 for the "No Lockdown Scenario". We estimated the costs by using top to bottom approach. The value and growth data of Indian economy is taken from International Monetary Fund (IMF) sources. The COVID-19 IPD, OPD, and ICU costs are collected from Federation of Indian Chambers of Commerce & Industry (FICCI) from the recently published literature in Outlook.

Study Inclusion

The current study limns the economic evaluation by encompassing the lockdown period from 25th March to 25th June (3 months), although the lockdown period may further extend.

Time horizon of analysis

The current study utilizes the time horizon of 1 year (2020).

Assumptions

Govt. of India has released home quarantine guidelines in India on 7th April 2020. The model uses the assumption that all OPD patients were institution quarantined till 7th April 2020 and will be home quarantined after 7th April 2020 by considering the outbreak and scarcity of IPD Beds. The number of IPD patients who will be provided the health services will be equal to number of IPD beds (including private and public) in India. Once all the health facility beds will be full, the patients will be provided services at home isolations or home quarantined wards. The same assumption will hold true for the ICU patients. It is considered that the preference will be given to the ICU patients who need mechanical ventilation over the patients who do not need mechanical ventilation. Medicinal costs are calculated based on the approved treatments of COVID-19. Hydro chloroquine (HCQ), Remdesivir and Azithromycin are included in the model as treatment. It is considered that out of total IPD days, a patient will stay for average length stay in ICU and will stay in IPD for rest of the days of treatment. We have used US data for ICU stay with lowest range as basis of calculation due to unavailability of Indian data. The rationale of lower range is based on that fact that the ICU stay is observed as lower in India as compared to US. The model utilized the MOHFW Data proportion of IPD, OPD, ICU cases out of total cases to calculate the number of patients in the respective categories till June 25th June 2020. The total number of COVID-19 diagnosis tests to declare the patient as COVID-19 positive is considered as one and total number of tests to diagnose a patient as COVID-19 negative are considered as two.

RESULTS

India has reported 473105 COVID-19 positive cases in the country till 25th June 2020. The model utilizes the MOHFW data proportion of IPD, OPD, ICU cases out of total cases to calculate the number of patients in the respective categories. The number of patients in each category is depicted below in Table 1.

Table 1: Depiction of the total number of patients in each category

Sr. No	Particular	Expected cases	Actual Cases
1	No. of OPD Patients	51868388	289621
2	No. of IPD only Patients	31213584	166604
3	No. of ICU patients with no mechanical ventilation	1577293	8807
4	No. of ICU patients with mechanical ventilation	69401	8073
5	Total	84728666	473105

Source: Total actual patient data is collected from MOHFW data [8] (https://www.mohfw.gov.in/), remaining are calculated values

The study has included the recommended treatments only for the calculation of medicinal costs. The recommended treatments and respective dosage are depicted in the Table 2.

Table 2: Depiction of respective dosage of each drug used for COVID-19 treatment

Sr. No	Drug	Recommended Dosage
1	Hydro chloroquine [9]	Loading Dose: 800mg Maintenance Dosage: 600mg 6 hours after 1st dose 600mg per day for 4 days
2	Remdesivir [10,11]	Loading dose on Day 1: 200 mg IV infused over 30-120 min Maintenance dose Days 2-10: 100 mg IV per Day
3	Azithromycin [12]	Loading Dose: Azithromycin (500 mg orally once a day on day 1 Maintenance dose: 250 mg orally daily on days 2-5 for 4 days

Source: Al-Kofahi, 2020, Medscape, Andrew Hill et al, 2020, and ClinicalTrials.gov

The model utilizes the following variable to form the basis of treatment costs calculations. Table 3 enlists some of the important variables used in the model.

Table 3: List of important variables used in the model

Sr. No	Particular	Value
1	Average Length [22] of stay in Days in ICU	4
2	Average Length of stay in Days in IPD including ICU [25]	14
3	Average Length of stay in Days in for Quarantine [18]	14
4	Proportion of Patients in OPD/Quarantine out of total positive cases [8]	0.61
5	Proportion of Patients in IPD out of total COVID-19 positive cases [8]	0.39
6	Average no of days of treatment with medicine in OPD cases [22]	14
7	Average no of tests done [24]	3

The study encompasses the model which calculated per patient costs in various categories of Health facilities used for COVID-19 treatment. Per patient costs for OPD, IPD and ICUs are delineated in the Table 4.

Table 4: Categories of various health facilities and associated costs (per patient)

Sr. No	Category of Health Facility	Cost in INR per patient
1	OPD costs [13-25]	42,175.3
2	IPD costs [13-25]	386,533.3
3	ICU costs with no mechanical ventilation [13-25]	411,145.3
4	ICU costs with mechanical ventilation [13-25]	473,812.0
5	Average cost of COVID-19 patient [13-25]	328,416.5

Source: The presented numbers are model calculated values

The overall medical treatment cost of 47305 COVID-19 patients in India is calculated as approximately INR 79.1 billion in the current scenario of lockdown for the period of 25th March to 25th June 2020 (3 months). This burden of cost could have been approximately INR 2.82 Trillion if the lockdown measures would have not been imposed in the mentioned period. Overall the nation-wide lockdown has helped India to save INR 2.74 Trillion of the medical treatment costs on COVID-19 patients during the period of 25th March to 25th June 2020 which is equal to 1.86% of Indian GDP measured by using Indian GDP of FY2019-20 at current prices as the basis of calculation.

CONCLUSION

The present study has limned that by enforcing the nation-wide lockdown India has saved 1.86% of Indian GDP measured by using Indian GDP of FY2019-20 at current prices as the basis of calculation. The current study is the presentation of only medical costs of the COVID-19 and it

does not incorporate the other associated costs of COVID-19. There is need of more studies in the current context by encompassing the non-medical impacts of COVID-19 to delineate a holistic picture of lockdown impact in India.

Limitations

The present study includes the following limitations

a) Non-medical costs which are attributed to COVID-19 like wage loss costs and transport costs etc. are not incorporated
b) Long term impacts of the COVID-19 are not studied
c) Only cases with clinical symptoms and diagnosed positive are considered in the model, sub-clinical cases are not considered
d) The segregation of private and public health facility costs is not depicted
e) The concepts of treatment impact, prognosis analysis and death analysis are not incorporated in the study

Abbreviation

- FICCI: Federation of Indian Chambers of Commerce & IndustryCOVID-19: Coronavirus Disease, 2019
- CBA: Cost Benefit Analysis
- WHO: World Health Organization
- CDC: Centers for Disease Control and Prevention
- INR: Indian National Rupees
- IPD: In-patient department
- OPD: Out-patient department
- ICU: Intensive Care Unit

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