What is the impact of the COVID-19 pandemic epoch on IPD (Inpatient Department) hospital admissions in India- A 41 months comparative, quantitative, deductive Cross-Sectional Research Study?

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Research Article

Keywords: IPD, Health services, COVID-19, SARS-CoV-2

Posted Date: September 15th, 2022

DOI: https://doi.org/10.21203/rs.3.rs-2054276/v1

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The inpatient department or IPD is the dedicated unit of a hospital/healthcare facility for admitting patients from the OPD (outpatient department), ED (emergency department), or a referred patient usually from lower facilities for a planned care/procedure, for special medical problems that necessitate suitable care and consideration. The index case of SARS-CoV-2 virus infection in India was first suspected (based on clinical grounds) on 27th January 2020, which has spread hastily worldwide in more than 200 countries [1]. The World Health Organization WHO with recommendation and strategy of the IHR (International Health Regulations (2005)) confirmed the COVID-19 (CORONAVIRUS DISEASE-2019) outburst as a Public Health Crisis of International Trepidation on 30th January 2020 and initiated issuing various protocols, strategies, advisories for global nations to contain the outbreak [2]. The index case of SARS-CoV-2 virus infection in India was first suspected (based on clinical grounds) on 27th January 2020, an assumed case of COVID-19 in Kerala with a current voyage history of Wuhan, China which was subsequently affirmed as SARS-CoV-2 virus infection positive case by the NIV (National Institute of Virology) situated at Pune in Maharashtra, on January 30th, 2020 as positive for COVID-19 [3].

The Government of India, to contain the COVID-19 outbreak announced and enforced an obligatory nationwide lockdown from 25th March 2020 to 31st May 2020 to trim down the incidence of new cases by putting lockdown intervention as a fence in the community spread [4]. This lockdown intervention with other factors such as fear, and apprehension of contracting COVID-19 disease had disrupted the scheduled - normal functioning of the health system delivery of various essential health services utilization in India [3, 5, and 6]. The stipulation of health services delivery is of major trepidation in India due to elevated as well as dense population with scanty resources, old twisted poor infrastructure amidst massive demand on the healthcare system. Newborn children, older citizens, and pregnant women are especially susceptible to the ongoing crisis impacted due to COVID-19 because of their extraordinary requirements of health needs [7].

The ongoing SARS-CoV-2 infection pandemic challenged the healthcare systems globally and India is not an exception [8]. The majority of resources of healthcare facilities including infrastructure, ambulance services, etc. medical personnel's, have been predominantly deployed to deal with the COVID-19 pandemic which has negatively affected various essential health services utilization [9, 10, and 11]. Added to this there are wide variations in healthcare delivery services among different states and union territories of India which is quite evident from the NITI AAYOG annual state health index [12]. The lack of dedicated and exclusive PUBLIC HEALTH MANAGEMENT CADRE (PHMC) in several states of India with poor governance especially in poor states like Bihar and Uttar Pradesh during the ongoing COVID-19 epoch. Now it is quite possible that these dead bodies are of people with serious conditions other then COVID-19 who failed to get IPD admissions for treatment and died subsequently without treatment.

Abstract

The inpatient department or IPD is the dedicated unit of a hospital/healthcare facility for admitting patients from the OPD (outpatient department), ED (emergency department), or a referred patient usually from lower facilities for a planned care/procedure, for special medical problems that necessitate suitable care and consideration. The index case of SARS-CoV-2 virus infection in India was first suspected (based on clinical grounds) on 27th January 2020, an assumed case of COVID-19 in Kerala with a current voyage history of Wuhan, China which was subsequently affirmed as SARS-CoV-2 virus infection positive case by the NIV (National Institute of Virology) situated at Pune in Maharashtra, on January 30th, 2020 as positive for COVID-19 [3].

Background/rationale

The inpatient department is usually operational with medical beds, medical equipment, and anytime availability of medical team. On a global basis, the index case of SARS-CoV-2 (severe acute respiratory syndrome-coronavirus-2) virus infection was first confirmed and reported from Wuhan City of Hubei province in China in the month December the year 2019, which has spread hastily worldwide in more than 200 countries [1]. The World Health Organization WHO with recommendation and strategy of the IHR (International Health Regulations (2005)) affirmed the COVID-19 (CORONAVIRUS DISEASE-2019) outbreak as a Public Health Crisis of International Trepidation on 30th January 2020 and initiated issuing various protocols, strategies, advisories for global nations to contain the outbreak [2]. The index case of SARS-CoV-2 virus infection in India was first suspected (based on clinical grounds) on 27th January 2020, an assumed case of COVID-19 in Kerala with a current voyage history of Wuhan, China which was subsequently affirmed as SARS-CoV-2 virus infection positive case by the NIV (National Institute of Virology) situated at Pune in Maharashtra, on January 30th, 2020 as positive for COVID-19 [3].

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The ongoing SARS-CoV-2 infection pandemic challenged the healthcare systems globally and India is not an exception [8]. The majority of resources of healthcare facilities including infrastructure, ambulance services, etc. medical personnel's, have been predominantly deployed to deal with the COVID-19 pandemic which has negatively affected various essential health services utilization [9, 10, and 11]. Added to this there are wide variations in healthcare delivery services among different states and union territories of India which is quite evident from the NITI AAYOG annual state health index [12]. The lack of dedicated and exclusive PUBLIC HEALTH MANAGEMENT CADRE (PHMC) in several states of India with poor governance especially in poor states like Bihar aggravated the crisis that erupted due to COVID-19 [13]. The WHO had also raised a question on the mortality count provided by the Government of India [14].

The Government of India response to the COVID-19 pandemic essentially followed procedures adopted by other global nations that included shutting down borders, restraining social interaction, and creating new COVID-19 segregation wards within mostly pre-existing hospitals wards as it is practically impossible to construct new dedicated COVID-19 healthcare facilities overnight to cater the needs of about 140 crores population of India [15]. The total COVID-19 cases Prevalence in INDIA as on 09th September 2022, 03:29 GMT were 44,482,411, mortality 528,090 [16]. As per the constitution of India Health is a subject matter of state, hence different states had reserved different percentages of beds in pre-existing health facilities for COVID-19 IPD patients, for example, the Delhi government had reserved 50% of pre-existing ICU (intensive care unit) and ward beds for COVID-19 IPD patients [17]. Besides the other factors such as fear etc,
mentioned above this new arrangement of hospital care delivery and prioritization of needs of COVID-19 patients may have resulted in the general cancellations of other IPD patients elective procedures leading to reduced IPD number of patients of diseases other than COVID-19, as priority was shifted to COVID-19 admitted patients and cases.

The first author researcher of this study has found unusual prevalence in the figure of IPD (Inpatient Department) hospital admissions during his normal course of duties at health centres throughout the current ongoing COVID-19(coronavirus disease-2019) era. To know about the real scenario a good sample size is a requirement for any epidemiological study. Hence this deductive study was started to confirm that, does the COVID-19 era has affected the number of IPD hospital admissions (positively or negatively). This study was started and designed to get an answer to the above question. Through the presentation of the whole story and figures, the researcher hopes that it will facilitate depicting a real scenario of the situation with the purpose to draw the consideration of policy and decision makers to contemplate measures of alleviation and providing relief in form of standard health services delivery to IPD patients in the situation of distress like COVID-19. This research study especially highlights the COVID-19 impacts on IPD health service utilization and access of people to IPD healthcare services during the COVID-19 era.

Aim & Objectives

The aim of this 41 months comparative, quantitative, deductive, Cross-Sectional Research Study is to assess the indirect impacts of COVID-19 on the number of IPD hospital admissions in India (other than COVID-19), across all public/private/rural/urban health facilities of 36 states and union territories registered on HMIS (Health Management Information System) of Ministry of Health and Family Welfare (MoHFW), Government of India on a cumulative basis. This unique study will also do a brief analysis of COVID-19 impact on IPD health service utilization of some important and more prevalent diseases in India.

The key objectives are to assess the count i.e. increase/decrease in the number of IPD patients in India during the covid-19 pandemic years in comparison to the pre-pandemic period. The Mean number of IPD patients will be considered for comparison of the same variable with a dissimilar duration of surveillance.

Methods & Materials

This is a unique research study done for highlighting COVID-19 impact on IPD health service utilization. Any alterations in the health outcomes like the numbers of IPD patients after the commencement of the COVID-19 epoch are assumed in this novel study to be special effects of this pandemic. The period of COVID-19 era will be compared to previous pre-pandemic years. The index case of SARS-CoV-2 virus infection in India was first reported in January 2020, hence for this study epoch before 1st January 2020 is measured as the pre-pandemic era and from 1st January 2020 the period is understood as the pandemic years on the foundation of the first covid-19 case in India as discussed above.

Study design & Period

This is a unique, novel, comparative, cross-sectional, retrospective, deductive observational research study premeditated at describing the panorama, dimensions, and extent of the unforeseen health impacts of the COVID-19 pandemic. A purposive sampled health facility-based retrospective cross-sectional research was conducted for IPD hospital admissions in India, across all public/private/rural/urban health facilities of 36 states and union territories registered on HMIS from 1st January 2018 to 31st May 2021. The first recognized COVID-19 case in India was found in January 2020; hence the period before 1st January 2020 i.e. years 2018 and 2019 are marked pre-pandemic period which is utilized for assessment with the continuing COVID-19 pandemic phase i.e.2020 and 2021 (up to May as data is available till this month only). The mean number of IPD patients per month is considered for comparison of the pandemic epoch with the pre-pandemic epoch to uncover the influence of COVID-19 on IPD services utilization.

Study Setting

This research study was carried out by uninterrupted surveillance of health facilities IPD data, of all public/private/rural/urban health facilities of 36 states and union territories registered on HMIS of the Ministry of Health and Family Welfare (MoHFW) from 1st January 2018 to 31st May 2021. The populations enclosed are residents of 36 states and union territories of India. As per the data obtained from HMIS, the total IPD registered during this period is shown in Table 1 and Figure 1. Exclusive information sources for the investigation are publicly accessible data from the Indian Health Management Information System (HMIS) of MoHFW, Government of India. The HMIS is an entrenched reporting arrangement used by all 36 states and union territories (UT) of India [18]. The information on HMIS is periodically uploaded on a scheduled basis from the entire HMIS registered health facilities across the nation.

Location

This investigation study includes all the Public-private-rural-urban health amenities situated in 36 states and union territories of India, whose information are obtainable on HMIS.

Period of study

This study started on 1st January 2018 and ended on 31st May 2021.

Exposure (Study Variables and Operational Definition)

The outcome variable of this study was IPD services utilization (number of IPD patients). IPD services utilization for this study was defined as number of:-

1. Inpatient (Male) - Children<18yrs
2. Inpatient (Male) - Adults
Any person in India who has been registered on HMIS for use of IPD services related to above mentioned purpose during study period were included in this study.

Follow up and Data collection

The data was constantly collected, observed and checked for SMART (specificity, measurability, accuracy, reproducibility and timeliness) objective. The Microsoft office and stata 15.1 software were utilized for this data collection and analysis.

Participants

Inclusion criteria - Any person in India who has been registered on HMIS for utilization of IPD services related to Operational Definition given above.

Exclusion criteria - Any person in India who has not been registered on HMIS for utilization of IPD services related to Operational Definition given above. All other diseases not related to Operational Definition were also excluded from this research study.

Sources and methods of selection of participants - The investigator has done purposive sampling for assortment of participants and the resource of data is HMIS of MoHFW.

Variables

Variables for this research study are mentioned above under Exposure section.

Data sources / measurement

The Source of Data is - HMIS-MoHFW and link is given below.

- https://hmis.nhp.gov.in/#/standardReports

For the evaluation of impact of COVID-19 induced situation on number of IPD patients in India the pandemic epoch is compared to pre-pandemic epoch, Data investigation were done with Microsoft office and stata 15.1 software.

Bias

To reduce the bias the mean were compared for calculating prevalence of IPD patients in India for different variables.

Study size (Sample Size and Sampling Technique)

The total numbers of IPD registered on HMIS for operational definition mentioned above were included in this study with a purposive sampling technique, see table-1. The data essential for this study was collected from HMIS of the MoHFW, which is the most endorsed and certified data source in India. The total quantity of indicators included for this research study was 12. The data composed and analyzed with Microsoft office and stata 15.1.

The size of different variables for study period is given in Table-1 below:

Ethical Consideration

This study did not require any informed consent or ethical endorsement since the data used were absolutely and publicly obtainable from HMIS and in compliance with Indian data protection policy.

Quantitative variables

The quantitative variables for this research study are mentioned below in Table-1 and Figure-1.

Data and Statistical Analysis
Stata 15.1 and Microsoft office software were utilized for statistical analysis. As the foremost step of the data investigation we calculated changes in IPD hospital admissions and compared the **mean number of IPD cases** over a 2-year pre-pandemic epoch (2018–2019) with the mean number of IPD cases over a 17-month pandemic epoch in 2020-2021, see Table-2 and Figure-2. We utilized HMIS data with the intention of determining the extent to which, IPD cases altered after the onset of the pandemic compared to the pre-COVID-19 pandemic across the hospital network in India. In the subsequent step of the investigation we calculated the **changes to mean IPD hospital admissions for 12 variables** mentioned above; see Table-3 and Figure-3. For both time periods (2018–2019 and 2020-2021) the **period prevalence (mean)** was calculated for IPD hospital admissions as a number of events (inpatient admissions) during specified period divided by the whole population during the two individual time epochs (population estimate based on the World Bank Estimate for India 2018-2021[19]).

**Table-1-** Total IPD registered during study period (study size of variables)
|----------|--------|--------|--------|--------|--------|--------|--------|--------|--------|--------|--------|--------|--------|--------|--------|--------|--------|--------|--------|--------|--------|--------|--------|--------|--------|--------|--------|--------|--------|--------|--------|--------|--------|--------|--------|--------|
Inpatient (Male) - Children<18yrs was 27614161 hospital admissions during Pre-pandemic and Pandemic epoch. The total mean numbers of Inpatient (Male) - Children<18yrs hospital admission were observed (2018-2019). The total mean numbers of IPD admissions were 5387311 compared to total mean 7435770 numbers of IPD admission for the previous pre-pandemic 2 years. The outcome data of this exploration study are presented as table-2, 3, 4 and gure-2, 3, 4. For the 17 months (2020-2021) COVID-19 pandemic epoch, the outcome data of this exploration study are presented as table-2, 3, 4 and gure-2, 3, 4. The GoI (Government of India) responded to this novel COVID-19 by enforcing nationwide lockdown from 25th March 2020 ending on 31st May 2020 and the total numbers of different IPD during the 41 months study period is elaborated in table − 1 and gure-1 with a little emphasis on lockdown in the gure-1.

Results
The total numbers of different IPD during the 41 months study period is elaborated in table – 1 and figure-1 with a little emphasis on lockdown in the figure-1. The GoI (Government of India) responded to this novel COVID-19 by enforcing nationwide lockdown from 25th March 2020 ending on 31st May 2020 and the total numbers of different IPD during the 41 months study period on HMIS at any public-private-rural-urban health facilities were 27614161number of Inpatient (Male)- Children < 18yrs; 72174649 number of Inpatient (Male)- Adults; 24945573number of Inpatient (Female)- Children < 18yrs; 121090894 number of Inpatient (Female)- Adults; 872855, 393407, 1509552, 5415845, 742661,7173524,7603860,505806 respectively for Inpatient – Malaria, Inpatient – Dengue, Inpatient – Typhoid, Inpatient – Asthma, Chronic Obstructive Pulmonary Disease (COPD), Respiratory infections, Inpatient – Tuberculosis, Inpatient - Pyrexia of unknown origin (PUO), Inpatient - Diarrhoea with dehydration, Inpatient – Hepatitis See table-1.

This research study revealed that there is a significant decrease in IPD hospital admissions for various medical conditions other than COVID-19 during the COVID-19 pandemic epoch which is a matter of concern for policy and decision makers.

Outcome data
The outcome data of this exploration study are presented as table-2, 3, 4 and figure-2, 3, 4. For the 17 months (2020-2021) COVID-19 pandemic epoch, the total mean numbers of IPD admissions were 5387311 compared to total mean 7435770 numbers of IPD admission for the previous pre-pandemic 2 years (2018-2019). The total mean numbers of IPD admission decreased by 2048459 numbers during COVID-19 pandemic epoch i.e.27.55% decrease in IPD hospital admission were observed during COVID-19 as compared to pre-pandemic epoch; see table-2 and figure-2.

<table>
<thead>
<tr>
<th></th>
<th></th>
<th></th>
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</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>No. of Obs.</td>
<td>Mean</td>
<td>Std. Err.</td>
</tr>
<tr>
<td>1</td>
<td>Inpatient (Male)- Children&lt;18yrs</td>
<td>24</td>
<td>763047.7</td>
</tr>
<tr>
<td>2</td>
<td>Inpatient (Male)- Adults</td>
<td>24</td>
<td>1968630</td>
</tr>
<tr>
<td>3</td>
<td>Inpatient (Female)- Children&lt;18yrs</td>
<td>24</td>
<td>688381.6</td>
</tr>
<tr>
<td>4</td>
<td>Inpatient (Female)- Adults</td>
<td>24</td>
<td>3271607</td>
</tr>
<tr>
<td>5</td>
<td>Inpatient - Malaria</td>
<td>24</td>
<td>27481.6</td>
</tr>
<tr>
<td>6</td>
<td>Inpatient - Dengue</td>
<td>24</td>
<td>13511.4</td>
</tr>
<tr>
<td>7</td>
<td>Inpatient - Typhoid</td>
<td>24</td>
<td>47707.6</td>
</tr>
<tr>
<td>8</td>
<td>Inpatient - Asthma, Chronic obstructive Pulmonary Disease (COPD), Respiratory Infections</td>
<td>24</td>
<td>152924.6</td>
</tr>
<tr>
<td>9</td>
<td>Inpatient - Tuberculosis</td>
<td>24</td>
<td>21122.6</td>
</tr>
<tr>
<td>10</td>
<td>Inpatient - Pyrexia of unknown origin (PUO)</td>
<td>24</td>
<td>229671.4</td>
</tr>
<tr>
<td>11</td>
<td>Inpatient - Diarrhoea with dehydration</td>
<td>24</td>
<td>237470.6</td>
</tr>
<tr>
<td>12</td>
<td>Inpatient - Hepatitis</td>
<td>24</td>
<td>14213.9</td>
</tr>
</tbody>
</table>

Mean number of various IPD hospital admissions during Pre-pandemic and Pandemic period

1. **Inpatient (Male) - Children<18yrs**: During the Pre-pandemic Epoch – January 2018 to December 2019 the mean number of IPD hospital admissions in India for Inpatient (Male) - Children<18yrs was 763047.7 (Std. Err.-17692.6; 95 % conf. Interval-726447.6 -799647.7) whereas during Pandemic Epoch – January 2020 to May 2021 the mean number of IPD hospital admissions in India for Inpatient (Male) - Children<18yrs was 547118.6 (Std. Err.-17692.6; 95 % conf. Interval-490373.7 -603863.6).
2020 to May 2021 it was 547118.6 (Std. Err.-26767.6; 95 % conf. Interval - 490373.7-603863.6), see table-2 and figure2.

2. Inpatient (Male) – Adults - During the Pre-pandemic Epoch – January 2018 to December 2019 the mean number of IPD hospital admissions in India for Inpatient (Male) – Adults was1968630 (Std. Err. - 45900.5; 95 % conf. Interval-1873677-2063582) whereas during Pandemic Epoch – January 2020 to May 2021 it was1466325, (Std. Err. - 58560.2; 95 % conf. Interval -1342183-1590467), see table-2 and figure2.

3. Inpatient (Female) - Children<18yrs - During the Pre-pandemic Epoch – January 2018 to December 2019 the mean number of IPD hospital admissions in India for Inpatient (Female) - Children<18yrs was688381.6, (Std. Err. - 16763.4; 95 % conf. Interval-653703.7-723059.5) whereas during Pandemic Epoch – January 2020 to May 2021 it was495553.8, (Std. Err. - 23513.8; 95 % conf. Interval -445706.7-545400.9), see table-2 and figure2.

4. Inpatient (Female) – Adults- During the Pre-pandemic Epoch – January 2018 to December 2019 the mean number of IPD hospital admissions in India for Inpatient (Female) – Adults was3271607, (Std. Err. - 69318.7; 95 % conf. Interval-3128210-3415004) whereas during Pandemic Epoch – January 2020 to May 2021 it was2504254, (Std. Err. -84495.9; 95 % conf. Interval -2325131-2683378), see table-2 and figure2.

5. Inpatient – Malaria- During the Pre-pandemic Epoch – January 2018 to December 2019 the mean number of IPD hospital admissions in India for Inpatient – Malaria was27481.6, (Std. Err. - 1332.0; 95 % conf. Interval-24725.9-30237.2) whereas during Pandemic Epoch – January 2020 to May 2021 it was12546.8, (Std. Err. -1114.3; 95 % conf. Interval -10184.4-14909.1), see table-2 and figure2.

6. Inpatient – Dengue- During the Pre-pandemic Epoch – January 2018 to December 2019 the mean number of IPD hospital admissions in India for Inpatient – Dengue was 13511.4, (Std. Err. - 2584.5; 95 % conf. Interval-8164.8 -18858.0) whereas during Pandemic Epoch – January 2020 to May 2021 it was 4066.5, (Std. Err. -412.1; 95 % conf. Interval -3192.9-4940.2), see table-2 and figure2.

7. Inpatient – Typhoid - During the Pre-pandemic Epoch – January 2018 to December 2019 the mean number of IPD hospital admissions in India for Inpatient – Typhoid was 47707.6, (Std. Err. - 2426.8; 95 % conf. Interval-42687.8-52727.4) whereas during Pandemic Epoch – January 2020 to May 2021 it was 17499.3-25391.1), see table-2 and figure2.

8. Inpatient – Asthma, Chronic Obstructive Pulmonary Disease (COPD), Respiratory infections- During the Pre-pandemic Epoch – January 2018 to December 2019 the mean number of IPD hospital admissions in India for Inpatient – Asthma, Chronic Obstructive Pulmonary Disease (COPD), Respiratory infections was 152924.6, (Std. Err. - 2472.2; 95 % conf. Interval-147810.6-158038.6) whereas during Pandemic Epoch – January 2020 to May 2021 it was 102685.6, (Std. Err. -8866.8; 95 % conf. Interval -83888.7-121482.4), see table-2 and figure2.

9. Inpatient – Tuberculosis- During the Pre-pandemic Epoch – January 2018 to December 2019 the mean number of IPD hospital admissions in India for Inpatient – Tuberculosis was 21222.6, (Std. Err. - 384.9; 95 % conf. Interval-20326.1-21919.0) whereas during Pandemic Epoch – January 2020 to May 2021 it was 18365.7, (Std. Err. -1108.4; 95 % conf. Interval -11516.0-16215.4), see table-2 and figure2.

10. Inpatient - Pyrexia of unknown origin (PUO) - During the Pre-pandemic Epoch – January 2018 to December 2019 the mean number of IPD hospital admissions in India for Inpatient – Pyrexia of unknown origin (PUO) was 229671.4, (Std. Err. - 13979.7; 95 % conf. Interval-200752.2-258590.7) whereas during Pandemic Epoch – January 2020 to May 2021 it was 97730, (Std. Err. -7916.9; 95 % conf. Interval -80946.8-114513.2), see table-2 and figure2.

11. Inpatient – Diarrhoea with dehydration- During the Pre-pandemic Epoch – January 2018 to December 2019 the mean number of IPD hospital admissions in India for Inpatient – Diarrhoea with dehydration was 237470.6, (Std. Err. - 12884.5; 95 % conf. Interval-210816.9-264124.3) whereas during Pandemic Epoch – January 2020 to May 2021 it was 112033.2, (Std. Err. -564.6; 95 % conf. Interval -546.4-10845.0), see table-2 and figure2.

12. Inpatient – Hepatitis- During the Pre-pandemic Epoch – January 2018 to December 2019 the mean number of IPD hospital admissions in India for Inpatient – Hepatitis was 14213.9, (Std. Err. - 709.4; 95 % conf. Interval-13531.2-130353.3) whereas during Pandemic Epoch – January 2020 to May 2021 it was 9686.5, (Std. Err. -546.4; 95 % conf. Interval -546.4-10845.0), see table-2 and figure2.

Decrease in mean number and Percent reduction in IPD hospital admissions during COVID-19

1. Inpatient (Male) - Children<18yrs – The mean IPD hospital admissions for Inpatient (Male) - Children<18yrs decreased by 215929.1 numbers or 28.29 % during covid-19 period as compared to Pre-pandemic period, see table-3 and figure-3.

2. Inpatient (Male) - Adults - mean IPD hospital admissions decreased by 502305numbers or 25.51 % during covid-19 period as compared to Pre-pandemic period, see table-3 and figure-3.

Table-3- Changes to mean IPD hospital admissions for 12 variables
### Variable

<table>
<thead>
<tr>
<th>Variable</th>
<th>Pre-pandemic Mean</th>
<th>Pandemic Mean</th>
<th>Decrease in mean IPD during covid-19 period</th>
<th>Percent reduction during covid-19 period</th>
</tr>
</thead>
<tbody>
<tr>
<td>Inpatient (Male)- Children&lt;18yrs</td>
<td>763047.7</td>
<td>547119</td>
<td>215929.1</td>
<td>28.29</td>
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<td>Inpatient (Male)- Adults</td>
<td>1969630</td>
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<td>Inpatient (Female)- Children&lt;18yrs</td>
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<td>4959554</td>
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<td>Inpatient (Female)- Adults</td>
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<td>Inpatient - Malaria</td>
<td>7481.6</td>
<td>12546.8</td>
<td>14934.8</td>
<td>54.34</td>
</tr>
<tr>
<td>Inpatient - Dengue</td>
<td>13511.4</td>
<td>4066.5</td>
<td>9444.9</td>
<td>69.90</td>
</tr>
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<td>Inpatient - Typhoid</td>
<td>4799.6</td>
<td>21445.2</td>
<td>26262.4</td>
<td>55.04</td>
</tr>
<tr>
<td>Inpatient - Asthma, Chronic Obstructive Pulmonary Disease (COPD), Respiratory infections</td>
<td>152924.6</td>
<td>102686</td>
<td>50239</td>
<td>32.85</td>
</tr>
<tr>
<td>Inpatient - Tuberculosis</td>
<td>21122.6</td>
<td>13865.7</td>
<td>7256.9</td>
<td>34.35</td>
</tr>
<tr>
<td>Inpatient - Pyrexia of unknown origin (PUO)</td>
<td>239671.4</td>
<td>97730</td>
<td>131941.4</td>
<td>57.44</td>
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<td>Inpatient - Diarrhoea with dehydration</td>
<td>237470.6</td>
<td>112033</td>
<td>125437.4</td>
<td>52.82</td>
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<tr>
<td>Inpatient - Hepatitis</td>
<td>14213.9</td>
<td>9686.5</td>
<td>4527.4</td>
<td>31.85</td>
</tr>
</tbody>
</table>

3. Inpatient (Female) - Children<18yrs - mean IPD hospital admissions decreased by 192827.8 numbers or 28.01% during covid-19 period compared to Pre-pandemic period, see table-3 and figure-3.

4. Inpatient (Female) - Adults - mean IPD hospital admissions decreased by 767353 numbers or 23.45% during covid-19 period compared to Pre-pandemic period, see table-3 and figure-3. This is the least reduction seen among all variables.

5. Inpatient – Malaria - mean IPD hospital admissions decreased by 14934.8 numbers or 54.34% during covid-19 period compared to Pre-pandemic period, see table-3 and figure-3.

6. Inpatient – Dengue - mean IPD hospital admissions decreased by 9444.9 numbers or 69.90% during covid-19 period compared to Pre-pandemic period, see table-3 and figure-3. This is the largest reduction seen among all variables.

7. Inpatient – Typhoid - mean IPD hospital admissions decreased by 26262.4 numbers or 55.04% during covid-19 period compared to Pre-pandemic period see table-3 and figure-3.

8. Inpatient - Asthma, Chronic Obstructive Pulmonary Disease (COPD), Respiratory infections - mean IPD hospital admissions decreased by 50239 numbers or 32.85% during covid-19 period compared to Pre-pandemic period see table-3 and figure-3.

9. Inpatient – Tuberculosis - mean IPD hospital admissions decreased by 7256.9 numbers or 34.35% during covid-19 period compared to Pre-pandemic period, see table-3 and figure-3.

10. Inpatient - Pyrexia of unknown origin (PUO) - mean IPD hospital admissions decreased by 131941.4 numbers or 57.44% during covid-19 period compared to Pre-pandemic period see table-3 and figure-3.

11. Inpatient - Diarrhoea with dehydration - mean IPD hospital admissions decreased by 125437.4 numbers or 52.82% during covid-19 period compared to Pre-pandemic period, see table-3 and figure-3.

12. Inpatient – Hepatitis - mean IPD hospital admissions decreased by 4527.4 numbers or 31.85% during covid-19 period compared to Pre-pandemic period, see table-3 and figure-3.

### Comparison of Period prevalence (mean) of IPD admission in India for different variables

The period prevalence is calculated utilizing The World Bank Data (see Table-4, 5 and figure-4). This novel research study revealed that the Period prevalence (mean) of IPD admission in India is significantly reduced during COVID-19 pandemic period as compared to pre-pandemic period which is a matter of concern for policy and decision makers.

1. Inpatient (Male) - Children<18yrs – The pre-pandemic period prevalence per 10000 population was 5.6 whereas during COVID-19 period it was reduced to 3.9 (see Table-4, 5 and figure-4).

2. Inpatient (Male) – Adults - The pre-pandemic period prevalence per 10000 population was 14.4 whereas during COVID-19 period it was reduced to 10.5 (see Table-4, 5 and figure-4).

3. Inpatient (Female) - Children<18yrs - The pre-pandemic period prevalence per 10000 population was 5.1 whereas during COVID-19 period it was reduced to 3.6 (see Table-4, 5 and figure-4).

4. Inpatient (Female) – Adults - The pre-pandemic period prevalence per 10000 population was 24.1 whereas during COVID-19 period it was reduced to 18.0 (see Table-4, 5 and figure-4).

5. Inpatient – Malaria - The pre-pandemic period prevalence per 10000 population was 0.20 whereas during COVID-19 period it was reduced to 0.09 (see Table-4, 5 and figure-4).
6. Inpatient – Dengue - The pre-pandemic period prevalence per 10000 population was 0.09 whereas during COVID-19 period it was reduced to 0.02 (see-Table-4, 5 and figure-4).

### Table-4- Period prevalence (mean) of IPD admission in India for different variables

<table>
<thead>
<tr>
<th>Variable</th>
<th>Pre-pandemic Mean</th>
<th>pre-pandemic period prevalence per 10000 population</th>
<th>pandemic period prevalence per 10000 population</th>
<th>Pandemic Mean</th>
</tr>
</thead>
<tbody>
<tr>
<td>Inpatient (Male)- Children&lt;18yrs</td>
<td>763047.7</td>
<td>5.6</td>
<td>3.9</td>
<td>547719</td>
</tr>
<tr>
<td>Inpatient (Male)- Adults</td>
<td>1366630</td>
<td>14.4</td>
<td>10.5</td>
<td>1466325</td>
</tr>
<tr>
<td>Inpatient (Female)- Children&lt;18yrs</td>
<td>688381.6</td>
<td>5.1</td>
<td>3.6</td>
<td>495554</td>
</tr>
<tr>
<td>Inpatient (Female)- Adults</td>
<td>3271607</td>
<td>24.1</td>
<td>18.0</td>
<td>2504254</td>
</tr>
<tr>
<td>Inpatient - Malaria</td>
<td>27481.6</td>
<td>0.20</td>
<td>0.09</td>
<td>12546.8</td>
</tr>
<tr>
<td>Inpatient - Dengue</td>
<td>13511.4</td>
<td>0.09</td>
<td>0.02</td>
<td>4066.5</td>
</tr>
<tr>
<td>Inpatient - Typhoid</td>
<td>47707.6</td>
<td>0.4</td>
<td>0.15</td>
<td>21445.2</td>
</tr>
<tr>
<td>Inpatient - Asthma, Chronic Obstructive Pulmonary Disease (COPD), Respiratory infections</td>
<td>152924.6</td>
<td>1.1</td>
<td>0.7</td>
<td>102686</td>
</tr>
<tr>
<td>Inpatient - Tuberculosis</td>
<td>21122.6</td>
<td>0.2</td>
<td>0.09</td>
<td>13865.7</td>
</tr>
<tr>
<td>Inpatient - Pyrexia of unknown origin (PUO)</td>
<td>229671.4</td>
<td>1.7</td>
<td>0.7</td>
<td>97730</td>
</tr>
<tr>
<td>Inpatient - Diarrhoea with dehydration</td>
<td>237470.6</td>
<td>1.7</td>
<td>0.8</td>
<td>112033</td>
</tr>
<tr>
<td>Inpatient – Hepatitis</td>
<td>14213.9</td>
<td>0.10</td>
<td>0.06</td>
<td>9686.5</td>
</tr>
</tbody>
</table>

7. Inpatient – Typhoid - The pre-pandemic period prevalence per 10000 population was 0.4 whereas during COVID-19 period it was reduced to 0.15 (see-Table-4, 5 and figure-4).

8. Inpatient - Asthma, Chronic Obstructive Pulmonary Disease (COPD), Respiratory infections - The pre-pandemic period prevalence per 10000 population was 1.1 whereas during COVID-19 period it was reduced to 0.7 (see-Table-4, 5 and figure-4).

9. Inpatient – Tuberculosis - The pre-pandemic period prevalence per 10000 population was 0.2 whereas during COVID-19 period it was reduced to 0.09 (see-Table-4, 5 and figure-4).

10. Inpatient - Pyrexia of unknown origin (PUO) - The pre-pandemic period prevalence per 10000 population was 1.7 whereas during COVID-19 period it was reduced to 0.7 (see-Table-4, 5 and figure-4).

11. Inpatient - Diarrhoea with dehydration - The pre-pandemic period prevalence per 10000 population was 1.7 whereas during COVID-19 period it was reduced to 0.8 (see-Table-4, 5 and figure-4).

12. Inpatient – Hepatitis - The pre-pandemic period prevalence per 10000 population was 0.10 whereas during COVID-19 period it was reduced to 0.06 (see-Table-4, 5 and figure-4).

### Table-5- THE WORLD BANK POPULATION DATA FOR INDIA

<table>
<thead>
<tr>
<th>Year</th>
<th>Population</th>
</tr>
</thead>
<tbody>
<tr>
<td>2018</td>
<td>1352642283</td>
</tr>
<tr>
<td>2019</td>
<td>1366417756</td>
</tr>
<tr>
<td>2020</td>
<td>1380004385</td>
</tr>
<tr>
<td>2021 (projected)</td>
<td>1399335837</td>
</tr>
</tbody>
</table>

Other analyses

This deductive research study revealed that the entirety IPD of all medical admissions in indoor have shown a radical reduction in numbers and percentages of IPD during COVID-19 period as shown in various tables and figures above. It’s a well acknowledged fact that population and diseases is mounting by leaps and bounds in India. Hence it is apparent from this research study that the novel COVID-19 induced state of affairs in India tends to have a disadvantageous and deleterious impact on other medical conditions IPD health services delivery and utilization.

Discussion

An initial massive drop down in IPD hospital admissions were observed in April 2020, soon after imposition of lockdown in India as well as after declaration of COVID-19 as a pandemic by the WHO. The total mean numbers of IPD admission decreased by 2048459 numbers during COVID-19 pandemic epoch i.e.27.55% decrease in IPD hospital admission were observed during COVID-19 as compared to pre-pandemic epoch. The general IPD admissions of medical conditions other than COVID-19 in Indian hospitals fell by 27.55% over the investigation period despite the fact that COVID-19 has been found to aggravate
Strength and Limitations of this study

The number of IPD decline may be explained by a prospect that prior information of COVID-19 through media and channels may have prejudiced prior health-concern, and premature mortality with morbidity.

It's also a well recognized fact that deferred initiations and interruption of treatment may augment disease progression, reappearance, stress, and complications in patients with medical conditions other than COVID-19 faced an amplified risk of complications, morbidity and mortality owing to reduced access to IPD treatment, while the previous chronic NCDs patients may have not received their regular therapy. It is quite obvious from this research study that majority of hospitals IPD or received public hospitals IPD care during the COVID-19 epoch. Patients with recently diagnosed NCDs may not be capable to get the IPD care during the COVID-19 epoch. How? Why? Naturally such question mark is coming to researcher mind. Few factors which may be responsible for this significant reduction in IPD admissions may be:-

1. Lockdown leading to reduced mobility.
2. Fear of contracting COVID-19 if admitted at hospital. The reluctance of public with healthcare requirements to seek hospital IPD care due to perceived hazard of acquiring a COVID-19 disease in a hospital setting
3. Reduced OOPE (out of pocket expenditure) capacity due to loss of jobs as indirect COVID-19 impact.
4. Lack of bed for IPD general admissions as a large portion was reserved for COVID-19 cases.
5. Self-Ignorance as well as family and social ignorance or negligence.
6. Lack of medical doctors and staff for medical conditions other than COVID-19 cases.
7. The Hospital medical staff shortages due to COVID-19 illness and mortality among the healthcare workforce.
8. Commotion within the hospital system in order to tackle the perceived obligations of the pandemic.
9. Decrease in the IPD admission referral rate as a result of the reduction in (OPD) outpatient hours.

This research study revealed that India experienced a decrease in inpatient hospital admissions for conditions which prevalence or incidence is not related to the COVID-19 pandemic, which can pose a grave health risk if left untreated. For an explanation consider the case of Inpatient - Asthma, Chronic Obstructive Pulmonary Disease (COPD), Respiratory infections, we calculated a 32.85% diminution in IPD admissions for such medical condition over the study period. The question arises what happened to these patients? A huge number of dead bodies were found floating in the sacred holy rivers of India (especially in the states of Bihar and Uttar Pradesh) during the ongoing COVID-19 epoch [24]. Now it is quite possible that these dead bodies are of people with serious conditions other then COVID-19 who failed to get IPD admissions for treatment and died subsequently without treatment. Added to this the relatives of these deceased people had thrown them in holy rivers with purpose to avoid visiting graveyard or funeral grounds due to fear as well as panic of contracting COVID-19 from these places as they think that only COVID-19 deceased are reaching these places.

This novel research study also revealed a distraction in number of male-female IPD of all ages, malaria, dengue, typhoid, Inpatient - Asthma, Chronic Obstructive Pulmonary Disease (COPD), Respiratory infections, Inpatient - Pyrexia of unknown origin (PUO), Inpatient - Diarrhoea with dehydration and hepatitis care during the COVID-19 study period.

In brief, like other nations, the natural response of healthcare authorities in India to the unexpected onset of COVID-19 was to tackle and mitigate the perceived priority requirements of COVID-19 patients. Investigation of HMIS data revealed that, as the pandemic outspread, this response resulted in a universal reduction of hospital IPD services, for the treatment of non COVID-19 precedence needs. The prospective consequences of this crash in IPD services in India may result in augmented mortality rates over the approaching years for diseases other than COVID-19.

Future VERSION of this research study using HMIS data can reveal to what magnitude IPD activity recovers over the upcoming years from the COVID-19 epoch.

The influence on patients of chronic medical conditions such as NCDs who require regular IPD care for improved health and good quality of life may be of grave consequences. India being a LMICs, it is predictable that the majority of the population underneath poverty line could not manage to pay for private hospitals IPD or received public hospitals IPD care during the COVID-19 epoch. Patients with recently diagnosed NCDs may not be capable to get the IPD treatment, while the previous chronic NCDs patients may have not received their regular therapy. It is quite obvious from this research study that majority of patients with medical conditions other than COVID-19 faced an amplified risk of complications, morbidity and mortality owing to reduced access to IPD healthcare. It's also a well recognized fact that deferred initiations and interruption of treatment may augment disease progression, reappearance, stress, concern, and premature mortality with morbidity.

This negative impact of COVID-19 epoch on IPD is due to countless factors, such as health workers being shifted for scheming the COVID-19 pandemic, etc. The number of IPD decline may be explained by a prospect that prior information of COVID-19 through media and channels may have prejudiced prior health-seeking behaviour.

Strength and Limitations of this study
The fundamental strength of this research study is the utilization of a data set on IPD activity for all HMIS (MoHFW) registered hospitals in India. It is furthermore the first systematic endeavour to describe the bearing of SARS-CoV-2 pandemic on IPD hospital admissions in India. The prime limitations of this study are lack of data availability from any other source as well as lack of discrete data for several other significant medical conditions.

Conclusions And Recommendations

The more regular and frequent publication of HMIS data can provide opportunities for judicious decision making in responding to unfolding emergencies such as COVID-19. Moreover, an in-depth study of the HMIS data set can make available insights into epidemiology, utilization patterns, and burden outcomes, including mortality rates. Though it appears India has responded reasonably well to the COVID-19 emergency, there is room for further improvement. The lesson India can learn from this incident is the need to advance strategies and processes whereby the reaction to pandemics is not unavoidably at the expense of other and similarly important other community health care needs. One area for upgrading is that while the reaction should be timely, health authorities need to respond proportionally, taking into description the population-wide health needs as the pandemic evolves and notify the public accordingly. The strategy should take account of an evaluation of the consequences to population health needs if existing resources are enthused from one care need to another. For hospitals, it would denote that their pandemic reaction is phased-in as well as likely in line with definite clinical need and prearranged around specialist task force with the aim of reducing disruption to the prerequisite of other medical services. This tactic however, would require the orderliness of hospitals to become more flexible in their ability to react to altering conditions, and to offer a safe patient environment at times of contagion/distress. In addition, better use of telemedicine would improve access to care at a time when estrangement measures are in place, and a well-targeted information drive would educate the community of the harmful consequences of not seeking care.

In the light of conclusion of this research study we recommend the following:

- Governments of India should think of strategies on priority basis to trim down the burden of morbidity and mortality to reap the benefits of Demographic Dividend. The COVID-19 management should be prioritized, but not at the cost of other NCDs and CDs.
- Government need a more robust and flexible health framework to respond to COVID-19/distress with due considerations of rigorous restrictions which can interrupt routine essential other health services, leading to a vicious cycle and overwhelming effect on the health need of population.
- Government of India should give more focus on proper and timely data collection.

Abbreviations

OPD- Outpatient Department; COVID-19- Coronavirus disease2019; SARS-CoV-2- severe acute respiratory syndrome coronavirus 2; (NIV) National Institute of Virology; (World Health Organization) WHO; Health Management Information System (HMIS); Ministry of Health and Family Welfare (MoHFW); IPD (Inpatient Department); ED (emergency department); IHR (International Health Regulations); NITI (National Institution for Transforming India); PUBLIC HEALTH MANAGEMENT CADRE (PHMC); ICU (intensive care unit);

Declarations

Funding

The author declares that no fund has been taken for this research study from any individual or agencies.

-This version of paper has not been previously published in any peer reviewed journal and is not currently under consideration by any journal. The document is Microsoft word with English (India) language and 8427 words Total including all.

-Ethics approval and consent to participate: Not applicable. This study has not involved any human or animals in real or for experiments. The submitted work does not contain any identifiable patient/participant information.

-Consent for publication: The author provides consent for publication.

-Availability of data and materials: Electronic records from HMIS (health management information system) of MoHFW (ministry of health and family welfare), Government of India.

-Conflicts of Interest/ Competing Interest: There are no conflicts / competing of interest

-Funding-Self sponsored. No aid taken from individual or agency etc.

-Authors' contributions: The whole work is done by the Authors - Dr Piyush Kumar, M.B.B.S., E.M.O.C., P.G.D.P.H.M., -Senior General Medical Officer- Bihar Health Services- Health Department- Government of Bihar, India and Advocate Anupama, Senior Lawyer, Bar-council, Patna, Bihar.

-Acknowledgements-I am thankful to Advocate Anupama my wife and daughters Aathmika-Atheeva for cooperation.

-Author information: The author is currently working as Senior General Medical Officer for the government of Bihar.

-Financial Support & sponsorship: Nil
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Figures

![Total IPD registered on HMIS in India during study period](image)

**Figure 1**

Total different IPD registered on HMIS in India during study period
Figure 2
Comparison of mean number of various IPD hospital admissions during study period

Figure 3
Percent reduction during COVID-19 period

Percent reduction in IPD admissions for various medical conditions during COVID-19
Comparison of Period prevalence (mean) of IPD admission in India

![Comparison of Period prevalence (mean) of IPD admission in India](image)

Figure 4

Comparison of Period prevalence (mean) of IPD admission in India for different variables