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Impact of COVID-19 induced lockdown on the OPD patients of Diabetes, Hypertension, Stroke (CVA), Acute Heart Disease, Mental Illness, Epilepsy, Ophthalmic, Dental and oncology in India- A Cross-Sectional Research Study

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Abstract

The First global covid-19 patient was reported from Wuhan city in China (Hubei Province) during December 2019. India's first suspected patient of SARS-CoV-2 infection was reported on 27th of January 2020, from Kerala state, which had a travel history of Wuhan city in china. This suspected case was tested and reported as the first covid-19 positive case by the (NIV) National Institute of Virology, Pune, on January 30, 2020. The government of India like other global countries responded to this novel disease by enforcing complete nationwide lockdown starting on 25/03/2020 and ending on 31/05/2020. In this cross-sectional research study, I had done assessment of the impact of covid-19 induced lockdown on OPD patients of few non communicable diseases (NCD). The data for different quantitative variables were collected for 12 months before and after lockdown, observed, analyzed for the years 2019, 2020, 2021. The complete lockdown period of April-May 2020 is compared with the previous 12 months of lockdown (including period of March 2020 which had only last 7 days of complete lockdown) as well as later 12 months. Also the lockdown months (April-May-2020) were compared to previous (April-May-2019) as well as next (April-May-2021) year same months. Here the researcher would like to emphasize that different months of years may have different numbers of patients due to seasonal and geographical variations in prevalence of diseases. The researcher had included the month of March 2020 in order to show the trends of OPD numbers to closest timeline before the lockdown. The OPD (outpatient Department) services for the patients of significant NCD burden such as Diabetes, Hypertension, Stroke (CVA), Acute Heart Disease, Mental Illness, Epilepsy, Ophthalmic, Dental and oncology were selected for this study-analysis to assess the difference between pre and post intervention (lockdown). The author previous preprints on this research study are mentioned in note and acknowledgement. This research study revealed that COVID-19 induced lockdown period have negative impact on NCD (non-communicable disease) - OPD health services utilization. Non-communicable diseases are the major burden of disease in India as well as at global levels. The researcher had done this study to draw the attention of policy makers and governments to give more attention on emphasis and priority for NCDs care in any situations of emergency like pandemic and natural calamities, lockdowns etc which usually disrupt routine healthcare. Routine healthcare is very essential and significant in context of chronic diseases which can be converted to acute

emergency conditions like CVA due to lack of care and proper-timely treatments.

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Introduction

Background/Rationale

The SARS-CoV-2 virus was first reported from Wuhan City, Hubei province of China in December 2019 and has spread worldwide in more than 200 countries [1]. The topmost health organization of the world (World Health Organization) WHO with reference and guidelines of the International Health Regulations (2005) declared COVID-19 outbreak a Public Health Emergency of International Concern on 30 January 2020 last year and started issuing various protocols, guidelines, advisories for all the nations of the world. On 27th January 2020, India found a suspected case of covid-19 in Kerala with a recent travel history of Wuhan; china. The suspected case was reported as positive by the National Institute of Virology located at Pune in Maharashtra, India on January 30, 2020 as positive for COVID-19 infection. This was the first documented COVID-19 case in India [2].The government of India responded to this novel disease by enforcement and implementation of nationwide lockdown starting on 25/03/2020 and ending on 31/05/2020[3]. Lockdown procedures, ensuring social distancing, and encouraging the populations to stay at home with hand hygiene and good ventilation with fresh air etc is being recommended by WHO time to time updated on daily basis almost[4]. Like most of the nations for saving lives India also imposed a strict lockdown countrywide. The lockdown helps to reduce numbers of new cases by putting a barrier in community spread while on the other hand it disrupted the routine-regular functioning of the health system delivery as well as for LMICs (Low-middle-income countries) like India a massive economic impact is inevitable [5].The provision of health services is of prime importance and key concern in India especially because of high dense population load as well as fewer resources, old fashioned poor infrastructure and massive demand on healthcare system. The children's, senior citizens, and women's are especially vulnerable because of special requirements of health needs [6]. The ongoing with ups and downs, SARS-CoV-2 pandemic challenged healthcare systems around the world. There is a sense of fear around the whole world due to pandemic and India is not an exception. The limited healthcare facilities including infrastructure, transportation (ambulance services) etc. manpower, have been chiefly deployed to deal with the situation of Covid-19 pandemic. This shift has detrimental impact on ongoing various health services running previously before the pandemic era. Added to this there are other impacts on domestic violence etc which have shown an increasing trend against women [5]. The researcher had also done research on **impact of Covid-19 on the Antenatal Care Services Utilization in Public-Private-Rural-Urban Hospitals of India which shows negative impact of covid-19 on**

ANC service utilization in India [2]. This is a unique novel cross-sectional observational research study. This researcher had done this study for highlighting that there is a very big global burden of disease called non-communicable disease particularly India is struggling with this NCD epidemic since several years. Through presentation of facts and figures the author hope that it will help to draw the attention of policy and decision makers to think about measures of mitigation and providing relief in form of regular health services to NCDs patients. This research study especially highlights the use of novel intervention lockdown impacts on health service delivery and access of population to healthcare services. Any change in the health outcomes like numbers of OPD patients after application of **lockdown intervention** are assumed in this study to be effects of this novel intervention. **Except one week of March the whole period of lockdown will be compared to previous year and next year of same timeline and duration to know the impact of intervention of lockdown as well as** the complete lockdown period of April-May 2020 is compared with the previous 12 months of lockdown (including period of March 2020 which had only last 7 days of complete lockdown) as well as later 12 months. The researcher would like to emphasize that different months of years may have different numbers of patients due to seasonal and geographical variations in diseases [7]. This research study also provides a short scenario of covid-19 pandemic year's impact on the same research question. For this purpose period before January 2020 is considered as pre-pandemic era and from January 2020 the period is assumed as pandemic years on the basis of first covid-19 case in India as discussed above. As per the World Health Organization factsheet details globally **NCDs kill 41 million people every year, equal to 71% of all deaths globally; every year, about 15 million people die from a NCD between 30 and 69 years; 85% of these deaths occur in LMICs (low- and middle-income countries); 77% of all NCD deaths are in LMICs like India; CVD (Cardiovascular diseases) account for most NCD deaths, or 17.9 million people annually, followed by cancers (9.3 million), respiratory diseases (4.1 million), and diabetes (1.5 million); These four account for over 80% of all premature NCD deaths[8]. The important risk factors include tobacco addiction, physical inactivity, harmful use of alcohol, unhealthy diets etc. The detection, screening and management of NCDs, as well as regular and palliative care, are significant to manage NCDs. The OPD services play a key role in above mentioned processes, hence looking at significance of the situations arising due to covid-19 author decided to do a study on the research question mentioned in the title.**

The National Disaster Management Authority (NDMA), Headed and chaired by Honorable Prime Minister of India Shri Narendra Modi, in exercise of the powers vested under section 6(2)(i) of the Disaster Management Act, 2005, has passed an Order dated 24.03.2020, directing the Ministries/ Departments of Government of India as well as the State/Union Territory Governments and State/ Union Territory concerned authorities to take proper and effective measures-protocols-guidelines to control the proliferation of COVID-19 in the nation. Ministries/ Departments of Government of India as well as the State/Union Territory Governments and State/ Union Territory concerned authorities in compliance of the said Order of NDMA as well as order issued by Ministry of Home Affairs (MHA) dated 24.03.2020 under Section 10(2)(l) of the Disaster Management Act, directing the Ministries/ Departments of Government of India, State/Union Territory Governments and State/ Union Territory Authorities to take effective measures for ensuring social distancing so as to prevent the spread of COVID-19 in the country. The Order of lockdown remained in force, in all parts of the country, for a period of 21 days with effect from 25.03.2020 and extended further up to 31st May. This fact is well documented in the newspapers, and international agencies like WHO and Government reports [3].

Objectives

The key aim of this unique novel cross-sectional observational retrospective research study are to evaluate the impact of the SARS-CoV-2 pandemic induced lockdown and **a brief analysis of covid-19 impact on OPD health service**utilization of some important NCD in India. **The prime objectives are to** assess the increase/decrease in total/mean number of OPD patients of Diabetes, Hypertension, Stroke (CVA), Acute Heart Disease, Mental Illness, Epilepsy, Ophthalmic, Dental and oncology in India during the lockdown months (April-May-2020) and covid-19 pandemic years. The comparison of lockdown months with previous year and next year with no lockdown intervention of equal period as well as with previous 12 months of lockdown (including period of March 2020 which had only last 7 days of complete lockdown) as well as later 12 months. Mean will be taken into account for comparison of same variable with different duration of observation.

Methods

Study design

This work is part of my unique novel comparative cross-sectional retrospective observational research studyintended at describing the scenery, measurements, and range of the indirect health impacts of COVID-19 control measures particularly lockdown during the epidemic.

Setting

The source of data is the Health Management Information System (HMIS) of Ministry of Health and Family Welfare (MoHFW), Government of India for knowing the trends of outpatient department visits of Diabetes, Hypertension, Stroke (CVA), Acute Heart Disease, Mental Illness, Epilepsy, Ophthalmic, Dental and oncology in India during the lockdown months (April-May-2020), as well as previous months and post lockdown months of the covid-19 pandemic years which is still going on globally. The HMIS is a well established reporting system used by all the 36 states and union territories of India available through MoHFW (the Ministry of Health India) [9]. The information on HMIS is uploaded on a routine basis from the entire health unit across the nation.

Location

This research study includes all the Public-private-rural-urban health facilities located in 36**states and union territories of India, whose reports are available on HMIS.**

Period of study

1st April 2019 to 31st May 2021

Exposure

Anyone in India who has been registered on HMIS for utilization of OPD services related to following:

1. Outpatient – Diabetes 2.Outpatient – Hypertension 3.Outpatient - Stroke (Paralysis) 4.Outpatient - Acute Heart Diseases 5.Outpatient - Mental illness 6.Outpatient – Epilepsy 7.Outpatient - Ophthalmic Related 8.Outpatient – Dental 9.Outpatient – Oncology

Follow up and Data collection

The data is continuously collected, observed and checked for specificity, measurability, accuracy, reproducibility and timeliness. The Microsoft office and stata software were utilized for this research study.

Participants

Inclusion criteria – Anyone in India who has been registered on HMIS for utilization of OPD services related to following:

1. Outpatient – Diabetes
2. Outpatient – Hypertension
3. Outpatient – Stroke (Paralysis)
4. Outpatient – Acute Heart Diseases
5. Outpatient – Mental illness
6. Outpatient – Epilepsy
7. Outpatient – Ophthalmic Related
8. Outpatient – Dental
9. Outpatient – Oncology

Exclusion criteria **-** Anyone in India who has not been registered on HMIS for utilization of OPD services related to following:

1. Outpatient – Diabetes
2. Outpatient – Hypertension
3. Outpatient – Stroke (Paralysis)
4. Outpatient – Acute Heart Diseases
5. Outpatient – Mental illness
6. Outpatient – Epilepsy
7. Outpatient – Ophthalmic Related
8. Outpatient – Dental
9. Outpatient – Oncology.

All other diseases OPD are also excluded from this research study.

Sources and methods of selection of participants

The researcher has done purposive sampling for selection of participants and the source of data is HMIS of MoHFW.

Variables

The quantitative variables for this research study were numbers of patients registered for following OPD:

1. Outpatient – Diabetes
2. Outpatient – Hypertension
3. Outpatient – Stroke (Paralysis)
4. Outpatient – Acute Heart Diseases
5. Outpatient – Mental illness
6. Outpatient – Epilepsy
7. Outpatient – Ophthalmic Related
8. Outpatient – Dental
9. Outpatient – Oncology.

Data sources / measurement

The link to Source of Data is given below

- **https://hmis.nhp.gov.in/#!/standardReports** – HMIS-MoHFW for OPD
- https://data.worldbank.org/indicator/SP.POP.TOTL.FE.ZS?locations=IN – World Bank for population

For the assessment of impact of covid-19 induced lockdown on number of OPD patients of Diabetes, Hypertension, Stroke (CVA), Acute Heart Disease, Mental Illness, Epilepsy, Ophthalmic, Dental and oncology in India during the lockdown months (April-May-2020) compared to previous year and next year same timeline and equal duration, I plotted the monthly numbers of cases-total/public/private/rural/urban against time and compared with previous year as well as next year. **Data analyses were done with Microsoft office and stata software.**

Bias

To reduce the bias the lockdown months mean were compared to previous and next 12 months of lockdown as well as population of India is taken into account for calculating prevalence of OPD for different variables.

Study size

Assuming that the whole population residing in India have been reported and registered for above mentioned variables on HMIS the population database of World Bank for India is taken into account with necessary forecast by linear regression done with Microsoft excel. The size of different variables and population for study period is given in Table 1 below:

Table 1– study size of variables and population

Apr-19 to May-21 – variables->	Outpatient - Diabetes	Outpatient - Acute Heart Diseases	Outpatient - Mental illness	Outpatient - Epilepsy	Outpatient - Ophthalmic Related	Outpatient - Dental	Outpatient - Oncology
TOTAL	67301836	5249532	10472705	1946015	52582246	44932845	3627378

Year	India-Population, total
2019	1366417756
2020	1380004385
2021	1399335837 projected

Quantitative variables

The quantitative variables for this research study are mentioned above in Table 1.

Statistical methods

Linear regression was used for forecasting population of 2021 with available data of population from World Bank.

Results

Participants

Anyone living in India during study period, which has been registered on HMIS for utilization of OPD services at any public-private-rural-urban health facilities related to following:

1. Outpatient – Diabetes
2. Outpatient – Hypertension
3. Outpatient – Stroke (Paralysis)
4. Outpatient – Acute Heart Diseases
5. Outpatient – Mental illness
6. Outpatient – Epilepsy
7. Outpatient – Ophthalmic Related
8. Outpatient – Dental
9. Outpatient – Oncology.

Descriptive data

The patients of above mentioned diseases/treatment/checkup/screening reaching out for OPD services at any public-private-rural-urban health facilities in India during the study period across 36 states and union territories of India were recorded from HMIS having exposure to OPD services. There may be underreporting or missed out cases due to this which is excluded from this study.

Outcome data

The outcome data of this research study are presented as Table 7 and Figure 5. The data analysis is presented in Table 2, 3, 4, 5, 6 and Figures 1 to 4.

Main results

The comparison of OPD during lockdown months with previous year and next year with no lockdown intervention of equal period-same months as well as with previous 12 months of lockdown (including period of March 2020 which had only last 7 days of complete lockdown) as well as later 12 months were studied in this research. Mean will be taken into account for comparison of same variable with different duration of observation. The statistical analyses of observations are given below in Table 2. The statistical analysis is not discussed in words to reduce the length of the article.

Table 2 – Statistical analysis of observations

Variable	Obs	Mean	Std. Dev.	Min	Max
Outpatient - Diabetes	26	2588532	360325.7	1731198	3059362
Outpatient - Hypertension	26	3058000	378008.1	2230625	3636275
Outpatient - Stroke (Paralysis)	26	53795.27	14629.35	28241	73417
Outpatient - Acute Heart Diseases	26	201905.1	52897.1	81327	284388
Outpatient - Mental illness	26	402796.3	114182.2	173368	552322
Outpatient - Epilepsy	26	74846.73	16061.26	40642	96042
Outpatient - Ophthalmic Related	26	2022394	778031.8	641712	3021790
Outpatient - Dental	26	1728186	706969.2	686065	2672246
Outpatient - Oncology	26	139514.5	37547.43	46189	202084

Mean estimation	Number of	obs =	26		
Variable	Mean	Std. Err	[95% Conf. Interval]		
Outpatient - Diabetes	2588532	70665.69	2442993	2734071	
Outpatient - Hypertension	3058000	74133.49	2905319	3210681	
Outpatient - Stroke (Paralysis)	53795.27	2869.052	47886.35	59704.19	
Outpatient - Acute Heart Diseases	201905.1	10373.97	180539.5	223270.7	
Outpatient - Mental illness	402796.3	22392.96	356677.2	448915.5	
Outpatient - Epilepsy	74846.73	3149.872	68359.45	81334.01	
Outpatient - Ophthalmic Related	2022394	152584.6	1708140	2336648	
Outpatient - Dental	1728186	138648.1	1442635	2013737	
Outpatient - Oncology	139514.5	7363.657	124348.8	154680.3	

April 2019, 2020 & 2021

A. Lockdown impact comparisons for April 2020 with unlock period of same timeline of previous and next year.

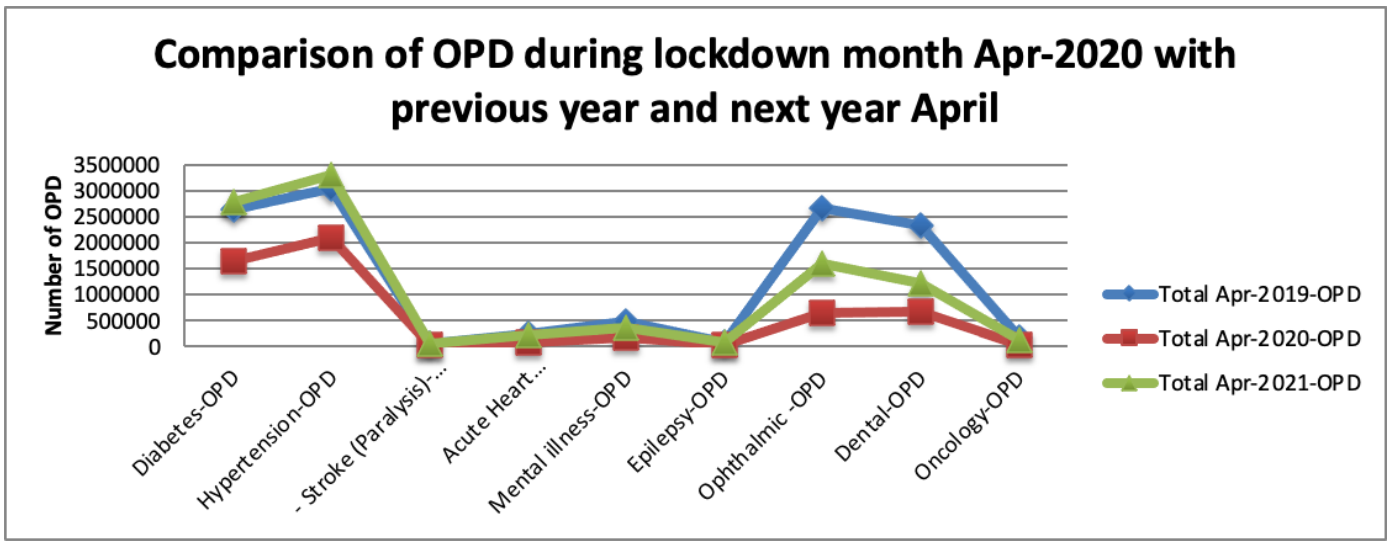
Table 3 – Comparison of lockdown month Apr 2020 OPD with previous year and next year April

Services	Total Apr-2019(Number of OPD)	Total Apr-2020(Number of OPD)	Total Apr-2021(Number of OPD)	Total decrease in Apr- 2020(Number of OPD) in comparison to Apr-2019	Percent decrease in total OPD in Apr-2020 in comparison to Apr-2019	Total decrease in Apr- 2020(Number of OPD) in comparison to Apr-2021	Percent decrease in total OPD in Apr-2020 in comparison to Apr-2021
Outpatient - Diabetes	2644246	1644625	2778268	999621	37.803631	1133643	40.80394692
Outpatient - Hypertension	3048900	2092962	3310756	955938	31.3535373	1217794	36.78295833
Outpatient - Stroke (Paralysis)	64075	32918	60568	31157	48.6258291	27650	45.65116893
Outpatient - Acute Heart Diseases	237022	78852	229725	158170	66.7322021	150873	65.67548155
Outpatient - Mental illness	486869	170345	359261	316524	65.0121491	188916	52.58461119
Outpatient - Epilepsy	91340	42966	73255	48374	52.9603679	30289	41.3473483
Outpatient - Ophthalmic Related	2665999	644210	1599149	2021789	75.836075	954939	59.71544865
Outpatient - Dental	2335144	678914	1219660	1656230	70.9262469	540746	44.3357985
Outpatient - Oncology	167477	42566	138587	124911	74.5839727	96021	69.28571944

The total number of diabetes patients accessing OPD health facilities in lockdown month of April 2020**declined by 999621** numbers and 37.803631% decreased as compared to previous year April 2019 OPD and by 1133643 numbers and 40.80394692 % less as compared to next year April 2021 OPD. The total number of hypertension patients accessing health facilities declined by 955938, 31.3535373% numbers and percent respectively as compared to previous year April 2019 OPD and less by 1217794, 36.78295833% numbers and percent respectively as compared to next year April 2021 OPD. The total number of Stroke (Paralysis) patients accessing health facilities declined by 31157, 48.6258291% numbers and percent respectively as compared to previous year April 2019 OPD and less by 27650, 45.65116893% numbers and percent respectively as compared to next year April 2021 OPD. The total number of Acute Heart Diseases patients accessing health facilities declined by 158170, 66.7322021% numbers and percent respectively as compared to previous year April 2019 OPD and less by 150873, 65.67548155% numbers and percent respectively as compared to next year April 2021 OPD. The total number of mental illness patients accessing health facilities declined by 316524, 65.0121491% numbers and percent respectively as compared to previous year April 2019 OPD and less by 188916, 52.58461119% numbers and percent respectively as compared to next year April 2021 OPD. The total number of epilepsy patients accessing health facilities declined by 48374, 52.9603679 numbers and percent respectively as compared to previous year April 2019 OPD and less by 30289, 41.3473483% numbers and percent respectively as compared to next year April 2021 OPD. The total number of eye patients, accessing health facilities declined by 2021789, 75.836075% numbers and percent respectively as compared to previous year April 2019 OPD and less by 954939,

59.71544865% numbers and percent respectively as compared to next year April 2021 OPD. The total number of dental opd patients, accessing health facilities declined by 1656230, 70.9262469% numbers and percent respectively as compared to previous year April 2019 OPD and less by 540746, 44.3357985% numbers and percent respectively as compared to next year April 2021 OPD. The total number of oncology opd patients, accessing health facilities declined by -124911, 74.5839727 numbers and percent respectively as compared to previous year April 2019 OPD and less by 96021, 69.28571944% numbers and percent respectively as compared to next year April 2021 OPD (see Table 3 and Figure 1). **The figure also shows that the OPD numbers improved in 2021 but it is still below for several diseases as compared to pre-pandemic year 2019. The researcher is doing this exclusive study on covid-19 impact on OPD which will be available in next version. This is second version of study, please see reference and acknowledgement.**

Figure 1 – Comparison of OPD during lockdown month Apr-2020 OPD with unlock previous year and next year April



May 2019, 2020 & 2021

B. Lockdown impact comparisons for May 2020 with unlock period of same timeline of previous and next year.

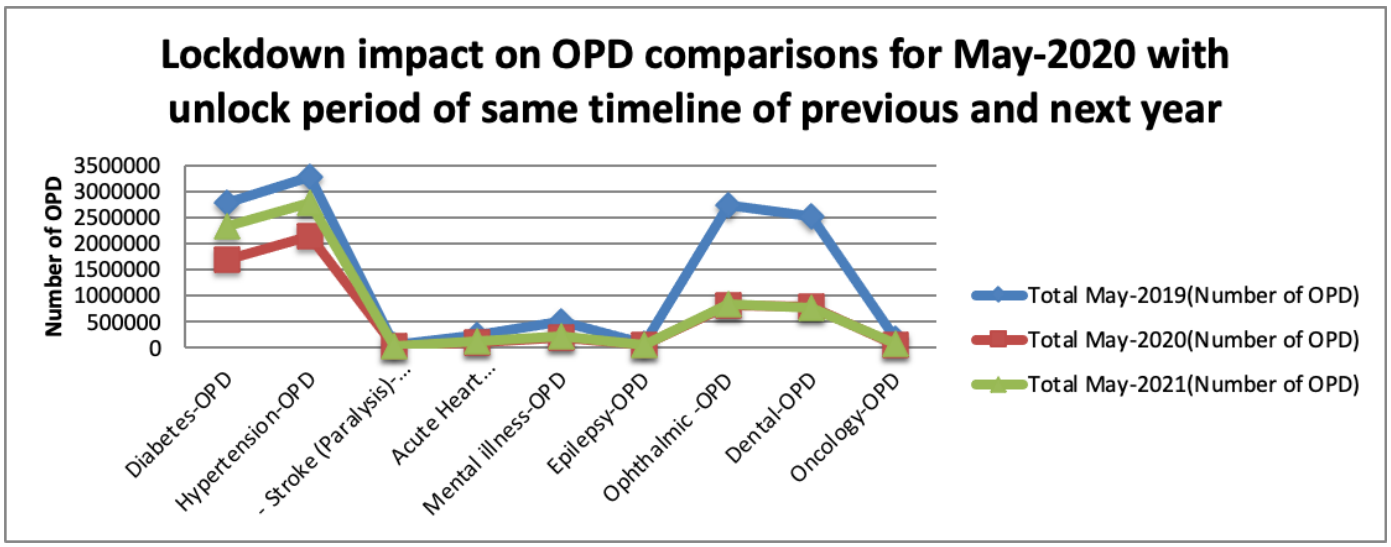
Table 4 – Comparison of lockdown month May-2020 OPD with previous year and next year May

Services	Total May-2019(Number of OPD)	Total May-2020(Number of OPD)	Total May-2021(Number of OPD)	Total decrease in May- 2020(Number of OPD) in comparison to May-2019	Percent decrease in total OPD in May-2020 in comparison to May-2019	Total decrease in May- 2020(Number of OPD) in comparison to May-2021	Percent decrease in total OPD in May-2020 in comparison to May-2021
Outpatient - Diabetes	2795140	1703871	2348269	1091269	39.04165802	644398	27.44140471
Outpatient - Hypertension	3281803	2141928	2797130	1139875	34.73319392	655202	23.42408111
Outpatient - Stroke (Paralysis)	67151	36011	44580	31140	46.37309943	8569	19.22162405
Outpatient - Acute Heart Diseases	249823	97046	138345	152777	61.1540971	41299	29.85218114
Outpatient - Mental illness	505997	197833	229668	308164	60.90233737	31835	13.86131285
Outpatient - Epilepsy	88047	46798	55026	41249	46.8488421	8228	14.95293134
Outpatient - Ophthalmic Related	2734647	815141	845694	1919506	70.19209426	30553	3.612772469
Outpatient - Dental	2536955	791717	780211	1745238	68.79262738	-11506	-1.474729272
Outpatient - Oncology	169710	63196	92225	106514	62.76235932	29029	31.47628083

The total number of diabetes patients accessing OPD health facilities declined by 1091269, 39.041658 % numbers and percent respectively as compared to previous year May 2019 OPD and less by 644398, 27.44140471% numbers and percent respectively as compared to next year May 2021 OPD. The total number of hypertension patients accessing OPD health facilities declined by 1139875, 34.7331939 % numbers and percent respectively as compared to previous year May 2019 OPD and less by 655202, 23.42408111% numbers and percent respectively as compared to next year May 2021 OPD. The total number of Stroke (Paralysis) patients accessing health facilities declined by 31140, 46.3730994 % numbers and percent respectively as compared to previous year May 2019 OPD and less by 8569, 19.22162405% numbers and percent respectively as compared to next year May 2021 OPD. The total number of Acute Heart Diseases patients accessing OPD health facilities declined by 152777, 61.1540971 numbers and percent respectively as compared to previous year May 2019 OPD and less by 41299, 29.85218114% numbers and percent respectively as compared to next year May 2021 OPD. The total number of mental illness patients accessing OPD health facilities declined by 308164, 60.9023374 % numbers and percent respectively as compared to previous year May 2019 OPD and less by 31835, 13.86131285% numbers and percent respectively as compared to next year May 2021 OPD. The total number of epilepsy patients accessing OPD health facilities declined by 41249, 46.8488421 % numbers and percent respectively as compared to previous year May 2019 OPD and less by 8228, 14.95293134% numbers and percent respectively as compared to next year May 2021 OPD. The total number of eye OPD patients accessing health facilities declined by 1919506, 70.1920943 numbers and percent respectively as compared to previous year May 2019 OPD and less by

30553, 3.612772469% numbers and percent respectively as compared to next year May 2021 OPD. The total number of **dental opd** patients accessing health facilities declined by 1745238,68.7926274 % numbers and percent respectively as compared to previous year May 2019 OPD and **greater by** 11506, 1.474729272 % numbers and percent respectively as compared to next year May 2021 OPD. The total number of oncology opd patients accessing health facilities declined by 106514, 62.7623593 numbers and percent respectively as compared to previous year May 2019 OPD and less by 29029, 31.47628083% numbers and percent respectively as compared to next year May 2021 OPD (see Table 4 and Figure 2). **The figure also shows that the OPD numbers improved in 2021 but it is still below for several diseases as compared to pre-pandemic year 2019. The researcher is doing this exclusive study on covid-19 impact on OPD which will be available in next version. This is second version of study, please see reference and acknowledgement.**

Figure 2 – Lockdown impact on OPD comparisons for May-2020 with unlock period of same timeline of previous and next year



Mean Comparison of lockdown with unlock pre-covid-19 period and covid-19 era post lockdown

C. Comparison of previous 12 months of lockdown (including period of March 2020 which had only last 7 days of complete lockdown) as well as later 12 months. **Mean/month** will be taken into account for comparison of same variable with different duration of observation.

Table 5 – Comparison of Mean OPD- previous 12 months of lockdown- 2 month of lockdown- later 12 months of lockdown

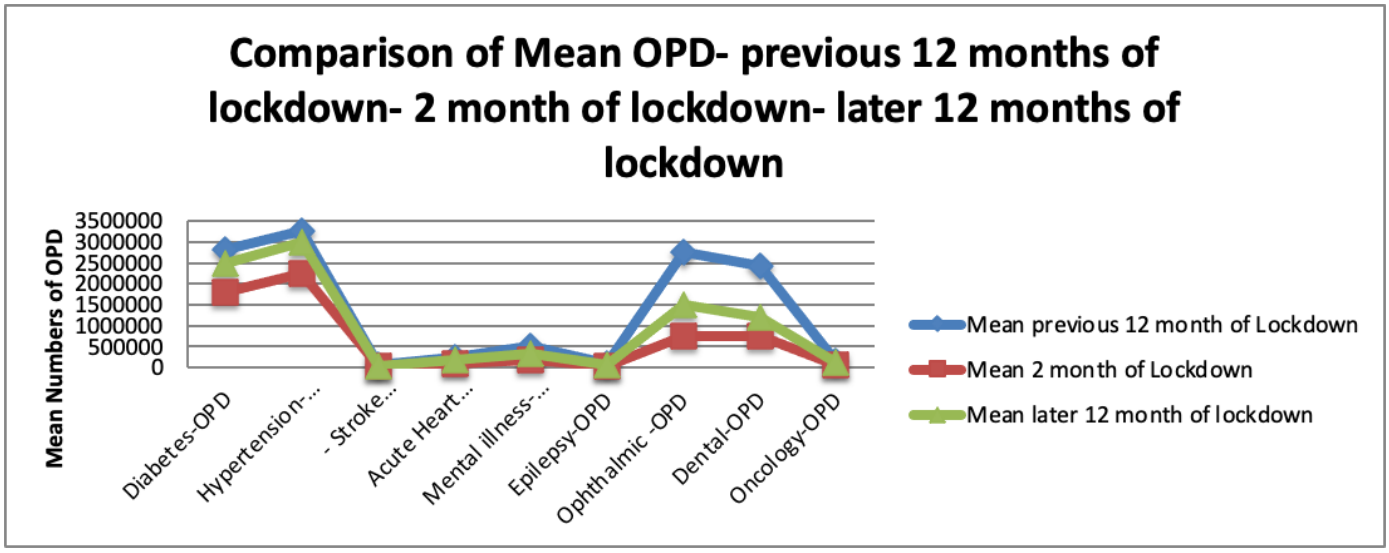
Services	Mean previous 12 month of Lockdown	Mean 2 month of Lockdown	Mean later 12 month of lockdown	Decrease mean no. OPD in lockdown compared to previous 12 month	Percent Decrease mean OPD in lockdown compared to previous 12 month	Decrease mean no. OPD in lockdown compared to later 12 month	Percent Decrease mean no. OPD in lockdown compared to later 12 month
Diabetes-OPD	2822362	1802271	2485746	1020091	36.14318	683475.6	27.49579
Hypertension-OPD	3266385	2261336	2982392	1005049	30.76947	721056.8	24.17713
- Stroke (Paralysis)-OPD	63478.08	30799	47945.17	32679.08	51.48089	17146.17	35.76203
Acute Heart Diseases-OPD	236567.7	98081	184546.5	138486.7	58.53998	86465.5	46.85296
Mental illness-OPD	500850.9	194796.5	339408.4	306054.4	61.10689	144611.9	42.60705
Epilepsy-OPD	86564.5	44183	68239.58	42381.5	48.95945	24056.58	35.25312
Ophthalmic - OPD	2745241	752106	1511262	1993135	72.60327	759156.3	50.23326
Dental-OPD	2431134	750685.5	1188156	1680448	69.122	437470.5	36.81928
Oncology-OPD	166472.8	61162	125615.1	105310.8	63.26005	64453.08	51.30999

During lockdown - the total mean number of diabetes patients accessing OPD health facilities declined by 1020091, 36.14318 % mean numbers and percent respectively as compared to previous 12 month OPD and less by 683475.6, 27.49579% mean numbers and percent respectively as compared to next 12 month OPD. The total mean number of hypertension patients accessing OPD health facilities declined by 1005049, 30.76947% mean numbers and percent respectively as compared to previous 12 month OPD and less by 721056.8, 24.17713% mean numbers and percent respectively as compared to next 12 month OPD. The total mean number of Stroke (Paralysis) patients accessing health facilities declined by 32679.08, 51.48089% mean numbers and percent respectively as compared to previous 12 month OPD and less by 17146.17, 35.76203% mean numbers and percent respectively as compared to next 12 month OPD. The total mean number of Acute Heart Diseases patients accessing OPD health facilities declined by 138486.7, 58.53998mean numbers and percent respectively as compared to previous 12 month OPD and less by 86465.5, 46.85296% mean numbers and percent respectively as compared to next 12 month OPD. The total mean number of mental illness patients accessing OPD health facilities declined by 306054.4, 61.10689% mean numbers and percent respectively as compared to previous 12 month OPD and less by 144611.9, 42.60705% mean numbers and percent respectively as compared to next 12 month OPD. The total mean number of epilepsy patients accessing OPD health facilities declined by 42381.5, 48.95945% mean numbers and percent respectively as compared to previous 12 month OPD and less by 24056.58, 35.25312% mean numbers and percent respectively as compared to next 12 month OPD. The total mean number of eye OPD patients accessing health facilities declined by 1993135, 72.60327 % mean numbers and percent respectively as compared to previous 12 month OPD and less by 759156.3, 50.23326 % mean numbers and percent respectively as compared to next 12 month OPD. The total mean number of **dental opd** patients accessing health facilities declined by 1680448, 69.122 % mean numbers and percent respectively as compared to

previous 12 month OPD and **less by**437470.5, 36.81928 % mean numbers and percent respectively as compared to next 12 month OPD. The total mean number of oncology opd patients accessing health facilities declined by 105310.8, 63.26005%mean numbers and percent respectively as compared to previous 12 month OPD and less by 64453.08 51.30999 % mean numbers and percent respectively as compared to next 12 month OPD (see Table 5 and Figure 3).

The figure also shows that the OPD mean numbers improved in 2021 but it is still below for several diseases during ongoing covid-19 as compared to pre-pandemic year 2019. The researcher is doing this exclusive study on covid-19 impact on OPD which will be available in next version. This is second version of study, please see reference and acknowledgement.

Figure 3 – Comparison of Mean OPD- previous 12 months of lockdown- 2 month of lockdown- later 12 months of lockdown



A brief analysis of covid-19 impact on OPD health service

D. A brief analysis of covid-19 impact is presented here by comparing OPD of pre-pandemic era i.e. before January 2020 and pandemic years i.e. January 2020 onwards (see Table 6 and Figure 4). The next version of this research which is going on will exclusively discuss covid-19 impact on prevalence of OPD.

Figure 6 – Comparison Mean no. of OPD/month pre-pandemic era and pandemic era

Month-year/variable	Mean no. of OPD/month pre-pandemic era-Apr-19 to Dec-19	Mean no. of OPD/month pandemic era-Jan-20 to May-21
Outpatient - Diabetes	2875920	2436386
Outpatient - Hypertension	3330732	2913612
Outpatient - Stroke (Paralysis)	66926.89	46843.24
Outpatient - Acute Heart Diseases	243408.1	179932.9
Outpatient - Mental illness	516002.8	342863.5
Outpatient - Epilepsy	88478.11	67630.12
Outpatient - Ophthalmic Related	2784274	1619046
Outpatient - Dental	2472057	1334373
Outpatient - Oncology	164180.8	126455.9

Table 6 and Figure 4 shows that covid-19 pandemic era has a negative impact on mean number of various OPD discussed in this research study. Table 6 and Figure 5 shows the data and impact of lockdown respectively. The next version of this study will discuss exclusively on covid-19 impact rather than lockdown.

Figure 6 – Comparison Mean no. of OPD/month pre-pandemic era and pandemic era

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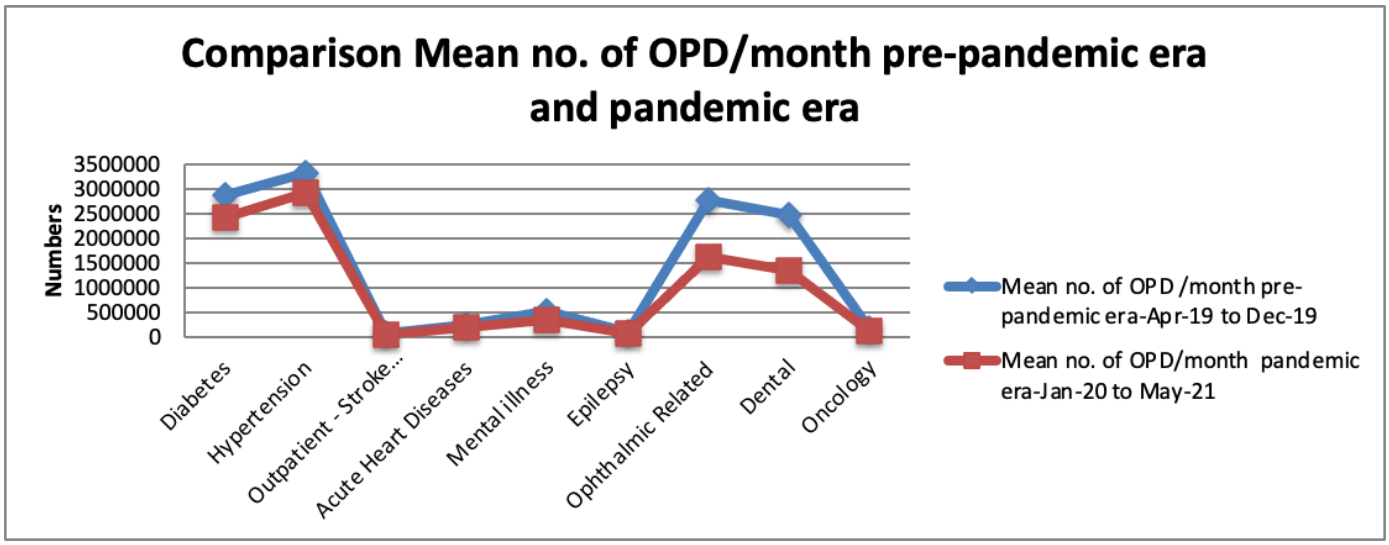
Figure 4 – Comparison Mean no. of OPD/month pre-pandemic era and pandemic era



Other analyses

Access to health service and utilization

The total OPD of all diseases in this study have shown a drastic reduction in numbers as well as in percentages of OPD during lockdown intervention period as shown in tables and figures. It's a well documented fact that population and NCD is increasing by leaps and bounds in India. Hence it is evident from the data analysis that the novel intervention of complete lockdown in India tends to have a detrimental and deleterious impact on health delivery services and utilization

Discussion

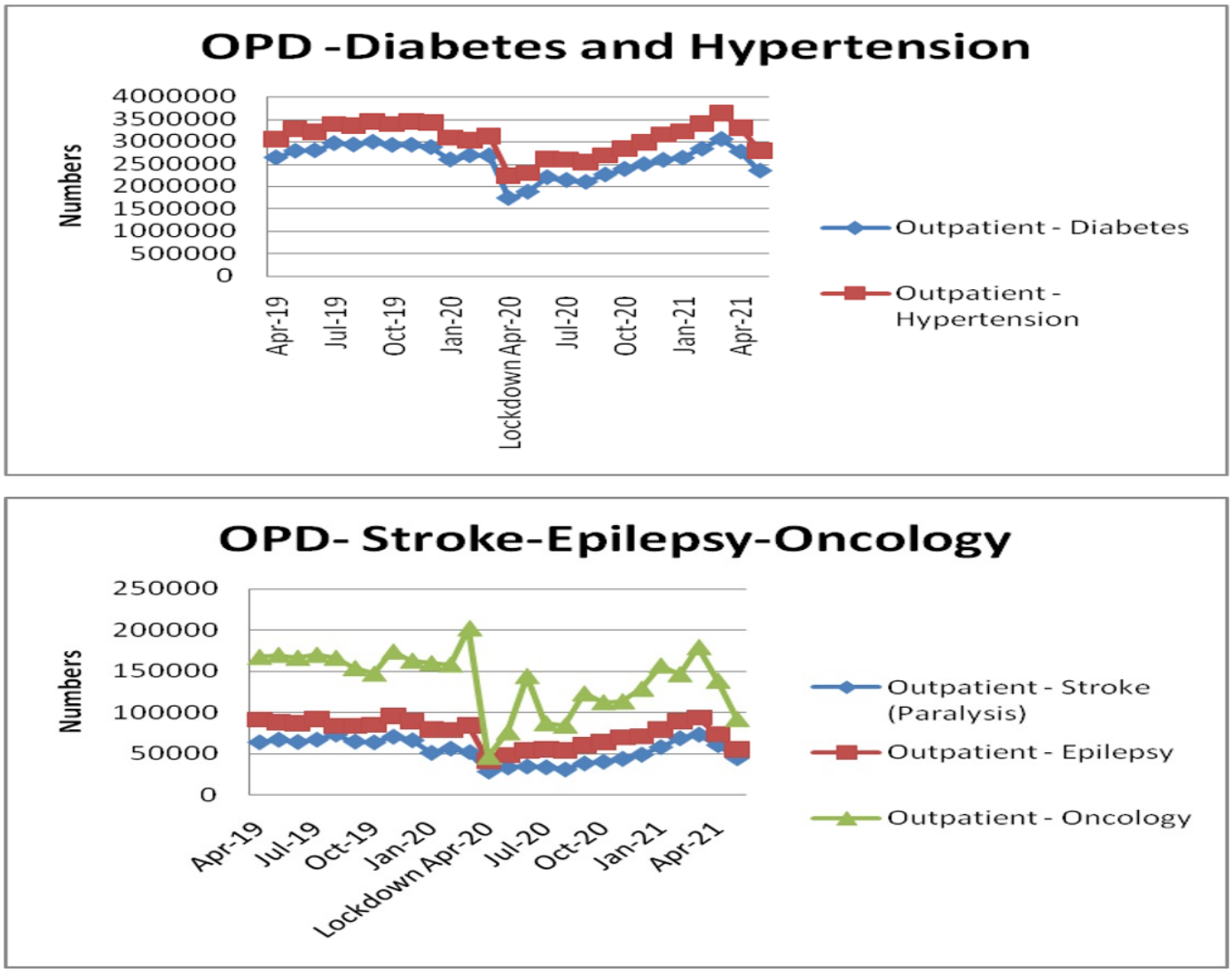
Secondary impacts of COVID-19 induced lockdown on health services:

The lockdown imposition controlled the outbreak at the cost of health service systems and livelihoods disruption. The government, diverted health personnel and resources away from priority NCD and other services like immunization, ANC, Family Planning, domestic violence, mental health etc. resulting in deterioration of essential health service utilization and delivery. The impact on patients of chronic conditions such as NCDs who need regular check-up and medicines for better health and good quality of life were unable to reach at OPD as evident from this retrospective observational study. India being a poor country, it is expected that most of the population below poverty line could not afford medication during the lockdown which is provided free at public health facilities Patients with newly diagnosed NCDs may not able to get the treatment, while the old chronic NCDs patients may have missed their regular therapy. It is quite evident from this study that majority of patients with title mentioned conditions faced an increased risk of complications, morbidity and mortality due to inability to access healthcare because of novel intervention of lockdown causing fear of contracting the virus from healthcare facilities/personals, transport restrictions, curfew, etc. It's also a well documented fact that delayed initiations and interruption of treatment regimens may increase disease progression, recurrence, stress, anxiety, and premature mortality with morbidity.

As mentioned above, the results of this study found that the complete lockdown in India during April, and May-2020 had negatively affected access and utilization of health services of OPD of title mentioned diseases. This negative impact of

lockdown intervention is due to many factors, such as health workers being shifted for controlling the COVID-19 pandemic and therefore not available for other healthcare services. The number of OPD declined may be explained by a possibility that prior knowledge of COVID-19 through media and communication channels might have influenced prior health-seeking behavior. The government is forced by external and internal pressure to impose strict restrictions due to novel nature of covid-19 which is still under study. Lockdowns are not the best choice for countries like India, and other LMICs with a huge population.

Figure 5 – OPD of various diseases showing a dip in numbers at the centre of graph during lockdown months



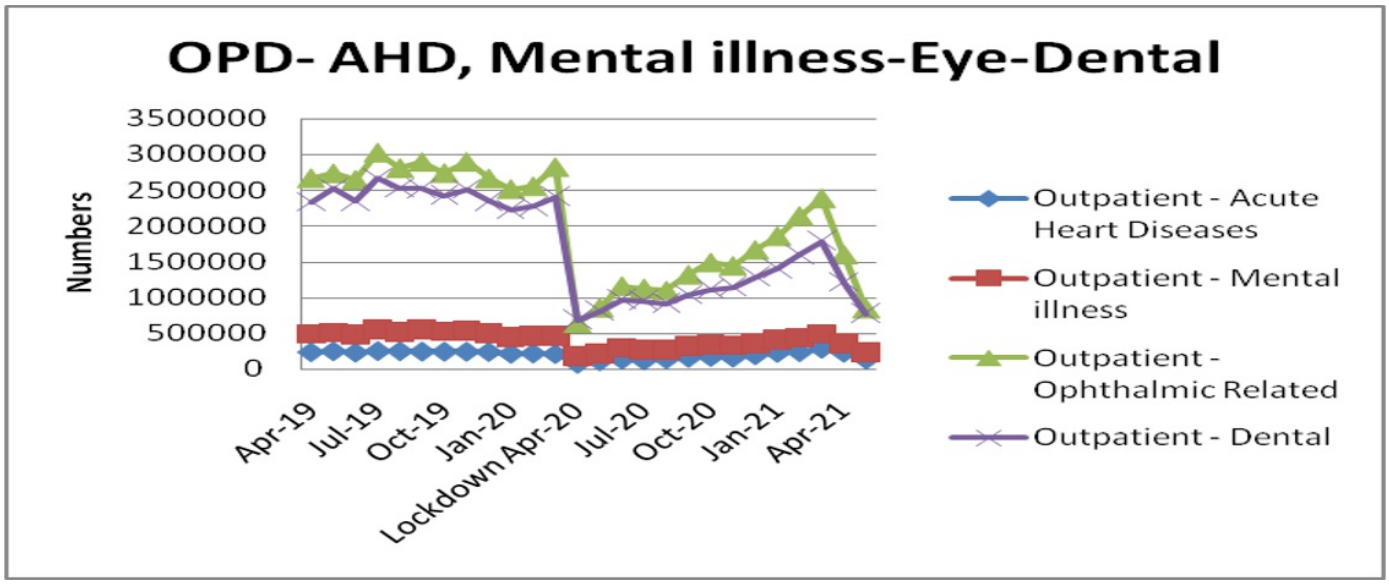


Table 7 – Observation of OPD of different months

Month-year/variable	Outpatient - Diabetes	Outpatient - Hypertension	Outpatient - Stroke (Paralysis)	Outpatient Acute Heart Diseases	Outpatient - Mental illness	Outpatient - Epilepsy	Outpatient Ophthalmic Related	Outpatient - Dental	Outpatient - Oncology
Apr-19	2644246	3048900	64075	237022	486869	91340	2665999	2335144	167477
May-19	2795140	3281803	67151	249823	505997	88047	2734647	2536955	169710
Jun-19	2804779	3211487	64444	230986	481899	86826	2644062	2344819	166349
Jul-19	2967601	3384065	67189	251523	552322	92087	3021790	2672246	169965
Aug-19	2935993	3353125	73417	249490	515732	83554	2806009	2532243	166335
Sep-19	2998495	3439635	64871	244055	547166	83850	2891490	2527159	153908
Oct-19	2926650	3389510	63895	243782	519739	85079	2738054	2432334	146988
Nov-19	2930937	3445577	70803	243746	533966	96042	2893908	2519969	173917
Dec-19	2879440	3422490	66497	240246	500335	89478	2662507	2347640	162978
Jan-20	2598906	3083030	51132	216416	440706	79393	2514531	2235482	159926
Feb-20	2694852	3023931	56284	219207	461835	78836	2551485	2275084	158036
Mar-20	2691303	3113064	51979	212516	463645	84242	2818404	2414527	202084
Lockdown Apr20	**1731198**	**2230625**	**28241**	**81327**	**173368**	**40642**	**641712**	**686065**	**46189**
Lockdown May20	**1873343**	**2292046**	**33357**	**114835**	**216225**	**47724**	**862500**	**815306**	**76135**
Jun-20	2200675	2612221	34429	136116	289265	53999	1160985	978148	144340
Jul-20	2137511	2593876	33498	124336	268555	55247	1129651	955892	87100
Aug-20	2095223	2536496	30793	142503	264446	54001	1097951	921149	84155
Sep-20	2260929	2692720	38204	161226	316134	60092	1320149	1037635	123131
Oct-20	2385627	2846491	40235	172843	336406	64091	1488797	1115087	112566
Nov-20	2494810	2981991	43811	164258	328725	69866	1445027	1151561	113710
Dec-20	2589833	3157074	48883	196038	354980	70881	1666666	1297506	128796
Jan-21	2637174	3224158	58109	227065	403577	79457	1856227	1404905	156839
Feb-21	2841272	3399520	68918	237715	436767	89298	2139287	1602356	146554
Mar-21	3059362	3636275	73314	284388	485117	93662	2385565	1793762	179378
Apr-21	2778268	3310756	60568	229725	359261	73255	1599149	1219660	138587
May-21	2348269	2797130	44580	138345	229668	55026	845694	780211	92225

Limitations of this study

The key data source for this study is HMIS, MoHFW. In this covid-19 pandemic, proper data collection is a big task and questionable. HMIS does data refreshment sometimes and personal collection of such big data is impossible and thus further analysis is limited. A very important limitation is that health awareness and related communication against COVID-19 started earlier than lockdown period. Hence very cautious people may have stopped visiting healthcare centers as a preventive action against COVID-19. The lockdown intervention was implemented throughout the nation leading to no areas that can be taken as control.

Conclusions and recommendations derived from this study

This retrospective observational quantitative and qualitative research study came to conclusion that the**lockdown management to reduce or control COVID-19 had a massive negative impact on delivery and utilization of important/essential health services**, and this aspect is clearly evident in April-May 2020. In the light of findings of this study I recommend the following:

- Governments of India should think of ways and strategies on priority basis to reduce the burden as well as morbidity and mortality occurring from NCDs. Compared to COVID-19 cases and deaths there are several other diseases which can obstruct India's way to reap the benefits of **Demographic Dividend**. The COVID-19 management should be prioritized, along with proper management of Other NCDs and CDs otherwise there are chances of increase in morbidity and mortality from several other diseases.
- Government should respond to COVID-19 with due considerations of stringent restrictions which can disrupt essential health services, leading to a **vicious cycle** and devastating effect on the health of population and economic crisis. Government should think of alternatives such as implementing standard operating procedures rather than imposing a lockdown.
- Government of India should give more focus on data collection system with inputs from local communities. There could have been more persons in the communities such as new NCDs cases who have not reached public/private health facilities which are not reflected in the HMIS data.

Other information

Abbreviations: OPD- Outpatient Department; COVID-19- Coronavirus disease 2019; CVA- Cerebro-vascular accident; SARS-CoV-2- severe acute respiratory syndrome coronavirus 2; (NIV) National Institute of Virology; non communicable diseases (NCD); world (World Health Organization) WHO; LMICs (low- and middle-income countries); CVD (Cardiovascular diseases); Health Management Information System (HMIS); Ministry of Health and Family Welfare (MoHFW)

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Note: - This article is available only as pre-print and not published by any peer-reviewed journals. The author has written previously on this research. There are chances of full/partial text and data overlapping with my own previous preprint works as well as this work is fully/partially available as preprints mentioned below in the references [10, 11, 12, 13, 14, 15, 16 and 17]

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Declarations

- 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 (United States) language and 7086 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.
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- **Funding-**Self sponsored. No aid taken from individual or agency etc
- **Authors' contributions**: The whole work is done by the Author - 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.
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