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Initial spreading of COVID-19 in Indian territory

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Abstract
The coronavirus COVID-19 pandemic is one of greatest thread caused by a virus which was first seen in china Wuhan city. Geographical Information System (GIS) provides excellent means for visualizing and analyzing epidemiological data, revealing trends, dependencies and inter-relationships. This research includes the use of GIS visualization of spreading of COVID- 19 in Indian districts. Research concluded that the COVID-19 virus has superior ability to cover diseases area in lesser time. On date 30 April 2020 in the India 58.46% districts ware becomes affected by COVID-19 virus. Area with higher population density ware more af- fected. COVID-19 should be taken as serious diseases and people must support authorities in preventing spreading. In future, more precautions should be taken in preventions any viral dis- eases.

Keywords: COVID-19, corona, pandemic, GIS, India.

Introduction
The coronavirus COVID-19 pandemic is one of greatest thread caused by a virus which was first seen in china Wuhan city. The World Health Organization declared the spreading of COVID-19 as a pandemic on 11 March 2020 [1]. As on date 19 May 19, 2020 world reach to 4,926,566 COVID-19 cases and having 320,892 death [2]. India is county having the second highest population reported its first COVID-19 case on 30 January 2020 [3]. On the date 19 May 2020 India shows 58802 active cases, 39173 cured and 3163 deaths [4]. According to WHO scientific brief, the COVID-19 virus shows that it is primarily transmitted between peo- ple through respiratory droplets and contact routes [5].

Geographical Information System (GIS) provides excellent means for visualizing and analyz- ing epidemiological data, revealing trends, dependencies and inter-relationships [6]. The disci- pline of medical geographic information systems provides a strong framework for our increas- ing ability to monitor these diseases and identify their causes. The GIS helps in understanding the spreading of diseases which may help in preventions measurers. Information about no of cases increasing in a particular area helps in analysis of hot sports zones. GIS also helps in proper utilization of human resources during an pandemic by analysis them. The research aims to help in understating of Spreading of Covid-19 virus in the Indian districts.

Material and methods
Description of study area
An Asian county India was selected as a study area. India is location lies between the northern hemisphere and eastern hemisphere. It has coordinates of latitudes 84′ N to 37°6'N & 68°7'E to 97°25'E longitude. India has a geographical area of 3,287,263 km2 which is divided into 28 states and 739 districts. India most important county needed to study for Covid-19 virus be- cause is having the second highest population after china.

Data acquisition

Table 1. Table for various data sources.

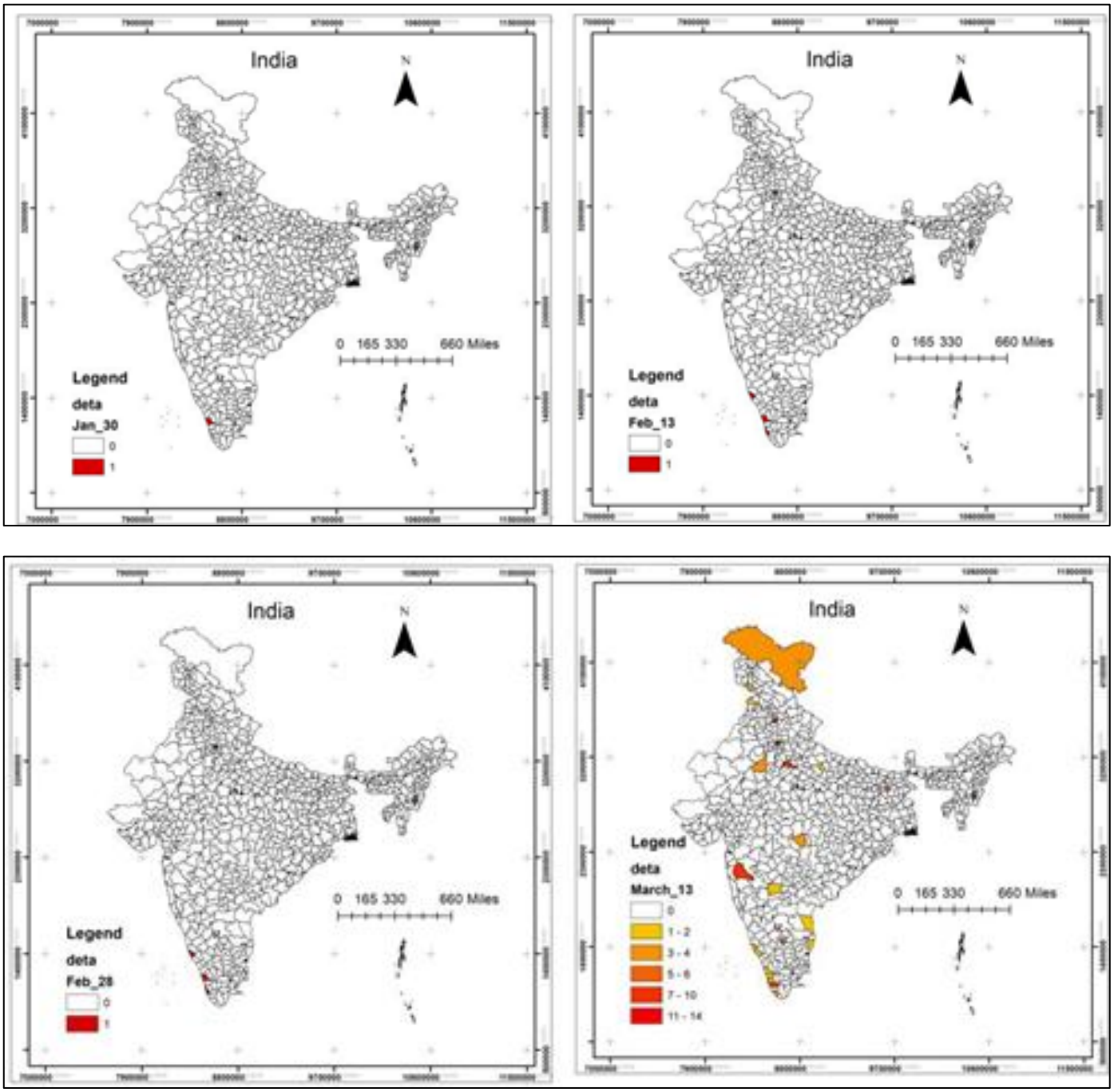
S. No.	Data type	Source	Description
1.	No of Covid-19 Patents	covid19india.org	It provides latest information about Covid-19 patents using various authen- tic sources
2.	No of Covid-19 Patents	mohfw.gov.in	Indian Government official website of Covid-19 patents information.

Software

ArcGIS 10.3 software of geographical information system was used for geo-spatial analysis and Geo-visualization of the data. It was utilized for making and utilizing maps, compiling ge- ographic information, analyzing mapped data, sharing and finding geographic data, utiliz- ing maps and geographic data in a extend of applications, and overseeing geographic data in a database. The shapefile of India with states and district boundary was used for analysis.

Result and discussions

First case of COVID-19 was seen in karela state in Thrissur district on 30 January 2020. After that on 13 February 2020 another two cases ware seen in Kasaragod and Alappuzha district of same state Karela. Further, there was no father increase in COVID– 19 cases till the 28 February 2020. 13 March 2020 number of cases ware reach to 97. After words, many passengers who ware reach to India from other countries started to shows COVID-19 symptoms and cases ware father increased. On basic of locations analysis, it shows that districts with higher pollution density show more cases of COVID-19.



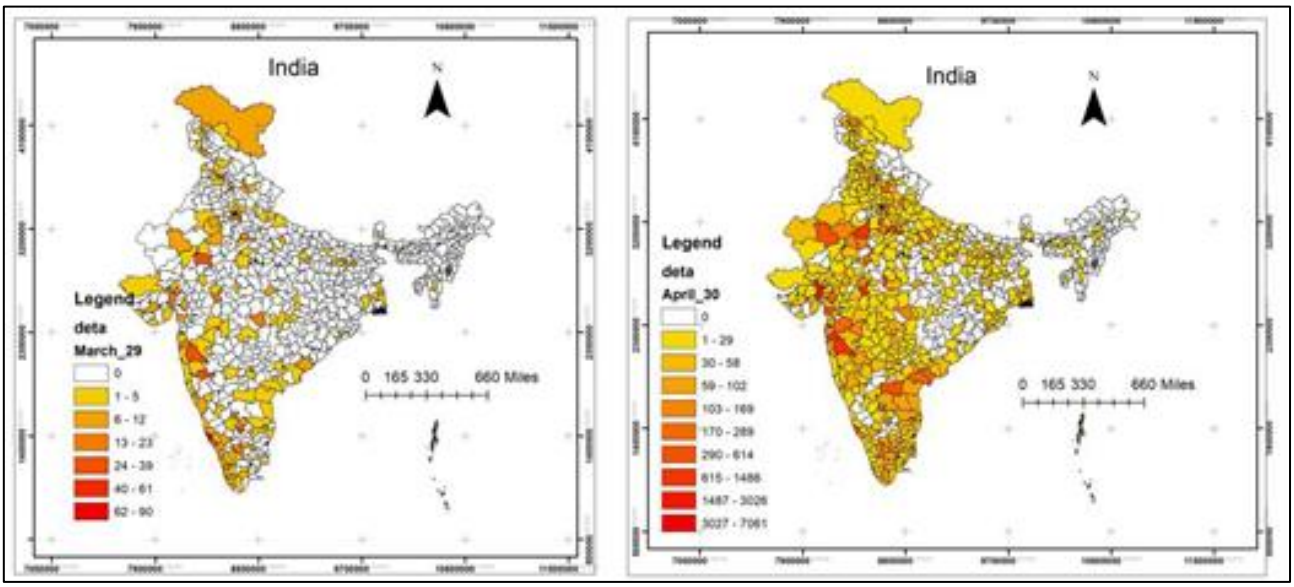


Fig 1: Districts vise spreading of COVID-19 from 30 January to 13 April 2020

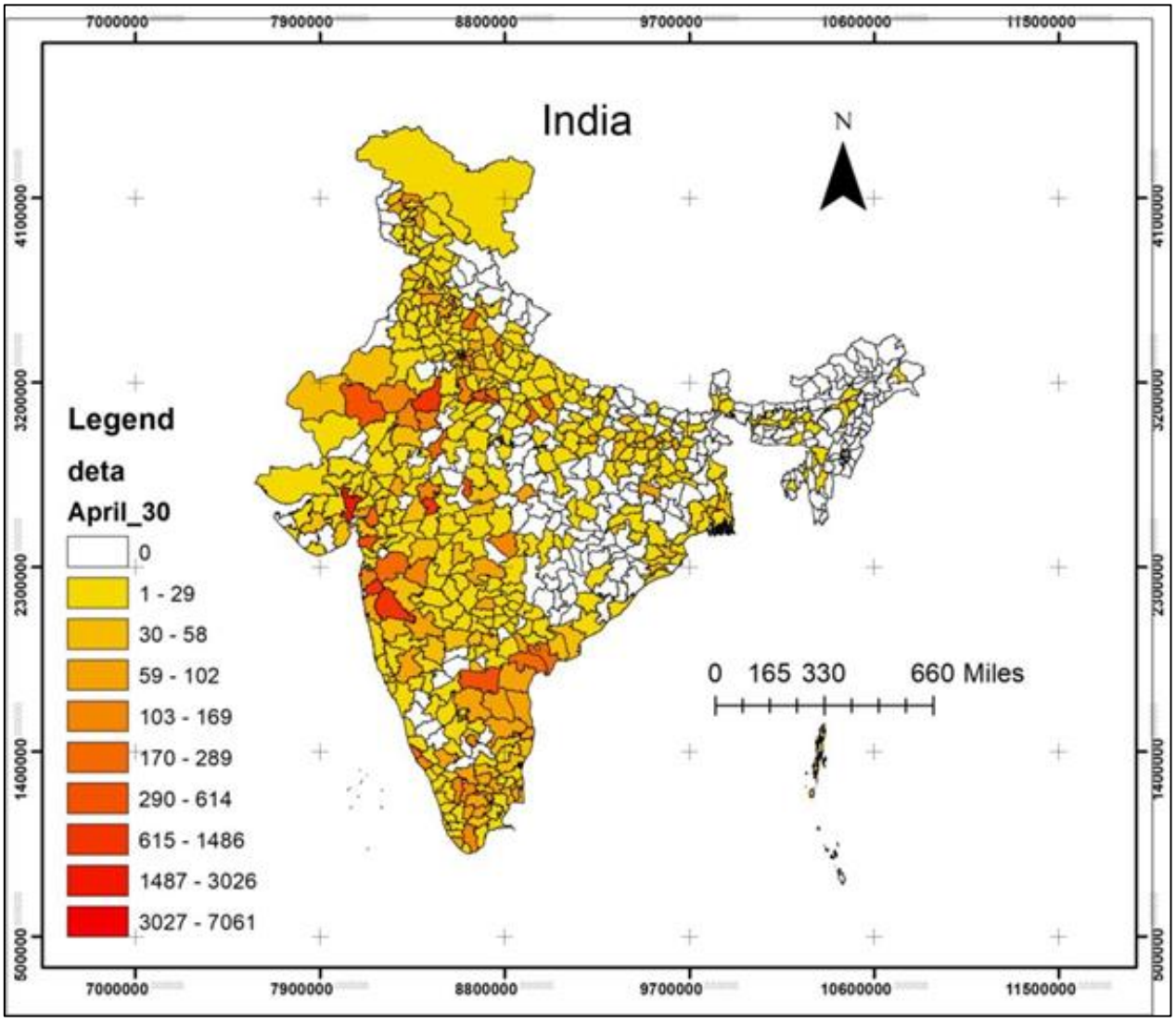


Fig 2: Districts confirmed of cases COVID-19 on 30 April 2020

Indian government decided to lock down the whole county from 22 March 2020. There was
649.485% increase in Covid-19 cases till 29 March 2020 and the number of cases reaches to 727. 1326.54% increase occurred when no of cases reaches to 10371 till 13 April 2020 which ware further increase to 34339 cases on date 30 April 2020. During 13 April to 30 April 2020, there was only 231.106% increased. On 30 April 2020 Mumbai, Ahmedabad and Delhi ware become the most affected area having high population density.

Research concluded that the COVID-19 virus has superior ability to cover diseases area in lesser time. Area with higher population density ware more affected. On date 30 April 2020 in the India 58.46% districts ware becomes affected by COVID-19 virus. COVID-19 should be taken as serious diseases and people must support authorities in preventing spreading. In future, more precautions should be taken in preventions any viral diseases.

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