

Summer Training Report

By

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MBA (Hospital and Health Management)

2019-21



ACKNOWLEDGEMENTS

Foremost, I would like to express my sincere gratitude to my mentor, Dr. Sujata Verma for the continuous support of my summer training study and research, for her patience, motivation, enthusiasm, and immense knowledge. Her guidance helped me in all the time of research and writing of this report. I could not have imagined having a better advisor and mentor for my training.

I would also like to extend my sincere gratitude towards our dean, Dr P.R. Sodani for guiding us throughout the internship period.

Last but not the least, I would like to thank my parents for supporting and caring for me in the time of pandemic. Without their support I would not have been able to complete this project.

PART-1

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ABBREVIATIONS

<i>ABBREVIATIONS</i>	<i>DEFINITIONS</i>
COVID-19	Corona virus
nCoV19	Corona virus
MoHFW	Ministry of health family welfare
WHO	World health organisation
CDC	Centers for disease control and prevention
ICU	Intensive care unit
CCDC	Chinese centre for disease control

ABSTRACT

Background: Corona viruses gained attention due to its discovery in December, in Wuhan city of China. The first case of COVID-19 in Delhi was detected on 2nd march 2020.

Objective: The aim of this comprehensive analysis is to provide a insights and status of the spread of corona virus in New Delhi state.

Materials and methods: The study was carried on secondary extracted from various websites like MoHFW, WHO, CDC and other government websites

Results: The results from the analysis shows that South, West and Central Delhi are the worst affected districts. Most of the cases i.e. 60% of them has been found in the people of age group 10-50, and males (76%) are more affected with corona virus as compared to females. An upward trend has been observed from the data(March-June) of all the three indicators that are number of confirmed cases, cured cases and deceased cases. The first case was reported in Delhi on 2nd march which is the earliest as compared to other worst hit states and the first 10,000 cases were seen on 2.5 months. The test done per million people is highest for Delhi which is good sign as the cases will be detected on time and the recovery will also be early. When lockdown wise cases were distributed it was observed that 77.3% cases were detected in reopening phase of lockdown.

Conclusion: It can be concluded from the analysis that Government is taking necessary steps, promoting non pharmacological remedies. The need of a situation is that everyone should follow guidelines provided by government and health department and should take necessary precautions.

INTRODUCTION

CoVs are the positive sense RNA viruses which belongs to coronaviridae family(1). These are widespread globally in animals and can cause infection to humans. 2019 Novel coronavirus(nCoV19), COVID-19 are some of its name given by world health organisation. 19 here refers to 2019 as it was first discovered in December 2019 from a patient's lower respiratory system in Wuhan city which is in China(2). As per the early reports it is said to have originated from a market which is famous for seafood in Wuhan, Hubei Province, China(3). Various epidemiological and etiological investigations has also been conducted there by Chinese Centre for Disease Control and Prevention (CCDC), but later on the final confirmation was given by WHO that the virus may be associated with the market but no clear evidence is of its link with the animals is found(4).

As it is a droplet infection, this virus spread rapidly among the Chinese people because there were mass gatherings of people due to chines new year. The most prominent symptoms of CoVs are fever, dry cough, difficulty in breathing and fatigue. Other symptoms which were later added to the list by CDC are chills, sore throat, headache, muscle pain, repeated shaking with chills and loss of taste and smell. Minute droplets from a person's nose or mouth that has COVID-19 coughing or exhaling may spread the disease from person to person.

These droplets may land on objects and surfaces, and by touching these objects or surfaces and then rubbing their eyes, nose , or mouth, others may catch the infection. Several coronavirus species can cause human respiratory infections that can be common cold or more serious illnesses such as Middle East Respiratory Syndrome (MERS) and Extreme Acute Respiratory Syndrome (SARS). Some estimates of the COVID-19 incubation time vary from 1-14 days, usually approximately five days.

The first documented case of Novel Coronavirus was registered in India from Kerala on 30 January 2020, where a student studying at the University of Wuhan, China, was tested positively with the deadly virus, whereas in Delhi the first case was detected on 2nd March 2020(5).

This has been declared public health emergency and is referred to as Pandemic as it has rapidly to around 114 countries and has took life of many(6). This is the first time after H1N1 "swine flu" that the WHO has called an epidemic a pandemic(7). As of 30th June 2020 there are 1,04,50,628 cases of COVID 19 confirmed globally and at least 5,10,632 people have died so far, whereas in India there are 5,85,703 confirmed cases and 17,410 people have died. When it comes to Delhi 87,360 are the confirmed cases and 2,742 people have lost their life so far(8).

With the expansion of the new COVID-19 infection and its effects on health of humans, the scientific community has acted quickly to this newly invented virus and concerned authorities are taking necessary actions while governments of different countries and states are playing an attentive role in eliminating this virus from there nations.

OBJECTIVE:

Broad Objective

A Comprehensive Analysis of COVID-19 outbreak situation in Delhi, India.

Specific Objectives

- 1) To enlist total number of districts affected by COVID-19.
- 2) To know the mortality, morbidity and recovery indicators among total tested positive COVID-19 individuals in Delhi and also the age sex composition.
- 3) To enlist the measures taken by the government nationwide and at community level in lockdown and unlock phases and some specific measures taken by Delhi government as compared to other state.

LITERATURE REVIEW:

For literature review, various previously published papers in last six months were searched on google scholar and PubMed. Keywords used for search include corona virus, COVID-19, India, Mortality, Delhi and characteristics. In the current scenario research industry is targeting the topic of COVID-19 analysis and estimation. There are several amount of articles and papers available which have estimated the effects and explained the characteristics of COVID-19 using different approaches. Nivedita Gupta performed a research Severe acute respiratory disease control of coronavirus disease 2019, India, 2020. Of the 5,911 SARI patients screened, a total of 104 (1.8 per cent) were positive for COVID-19. Such cases were registered in 20 States / Union Territories from 52 districts. The positivity of COVID-19 among males and patients older than 50 years was higher. In total, 40 COVID-19 cases (39.2 per cent) showed no history of contact with a documented case or international travel.(9).

A research conducted by Nitesh Gupta aimed at documenting the initial experience with epidemiological and clinical characteristics, as well as the management of COVID-19 patients in India. This is a descriptive case sequence of the first 21 COVID-19 infected patients reported with polymerase chain reaction (PCR) from 01.02.2020 to 19.03.2020 admitted to Indian tertiary care centre. Medical, laboratory, and radiological data including age , sex , ethnicity, travel history, symptoms, length of stay, and comorbidities were collected. The population's median age was 40.3 years with a male preponderance. In the previous 30 days, 13 (62%) patients had recent travel history outside India, two thirds of whom had travelled to Italy. Fever and cough (42.9 per cent) were the most common symptoms, accompanied by sore throat, headache and breathlessness. All patients retained critical and laboratory parameters and none of them needed ventilatory support. Among the first 21 patients diagnosed with COVID-19 infection in India, the typical clinical presentation consisted of a mild infection of the upper respiratory tract which mainly affected the young male population. One patient requested extra oxygen. All patients without residual effects recovered. (10).

Clinical characteristics of corona virus were observed using the study of Samander Kaushik regarding the Indian perspective of Coronavirus its was observed that Patients arrive with unexplained viral upper respiratory infection. Most patients show fever, cough , sore throat, nasal congestion, malaise and headache symptoms. The elderly and other patients who are immunocompromised have more and more severe atypical symptoms. While these patients lack dehydration, sepsis or shortness of breath (11).

Dipu rai in an article showed that in India more than half of the cases comprises of youth. Of the 1,801 confirmed cases of novel coronavirus, 43% comprises of the people from age group 20-39, followed by 17% in the 40-49 age group as per the data observed. That means around 60% of patients are under 50 years of age according to which young age people have higher chances of getting the disease. According to the figures, 22% (391 cases) are those between the ages of 30 and 39, followed by 21% (376 cases) in their twenties, while 17% are those in their forty years.

Studies from nations like China and Italy find the community that is susceptible to the disease to be elderly people. Whereas people over 60 years of age in India account for just 19 % of the total reported cases, people over 80 years of age account for less than 2%.

As of April 1, children under the age of 10 were just 3 percent, or 46 cases. In confirmed cases, the gender-specific disparity is often evident along with age. Statistics indicate 73% of the 1,801 cases are male, while only 27% are female. For female patients, the highest cases are women aged 20 to 29 years, with about 110 cases reported in this group until April 2(12).

METHODOLOGY

Design:

Cross-sectional Descriptive study design.

Data sources and data extraction:

Data was collected from various secondary sources like articles, journals, websites and papers to know the status mortality, morbidity, recovery, total tested positive individuals, rate of infection, rate of decrease in new cases, rate of increase in new cases, age-sex composition of covid19 patients affected in Delhi and also positive steps taken by the governments towards this. Data was gathered from the website of MoHFW and covid-19 India for various districts of Delhi, parameters and indicators of mortality and morbidity. Statistics on age and sex composition, strategies of lockdown by Delhi government for COVID-19 cases was accumulated from online article of various newspapers. List of covid -19 designated hospitals and information on number of ICU beds, normal beds and ventilators was collected from the official mobile application developed by Delhi government.

RESULTS

According to MoHFW COVID 19 cases in Delhi:

- Total confirmed cases: 87,360
- Active cases: 26,270
- Cured/Discharged/Migrated: 58,348
- Death: 2,742

District wise data:

<i>Name of the district</i>	<i>Number of cases</i>	<i>Percentage</i>
<i>NORTH EAST DELHI</i>	25	0.029%
<i>NORTH WEST DELHI</i>	32	0.036%
<i>NEW DELHI</i>	37	0.043%
<i>EAST DELHI</i>	38	0.044%
<i>SOUTH WEST DELHI</i>	42	0.046%

SHAHADARA	48	0.053%
NORTH DELHI	60	0.069%
SOUTH DELHI	70	0.08%
WEST DELHI	122	0.14%
SOUTH EAST DELHI	130	0.15%
CENTRAL DELHI	184	0.21%
UNKNOWN	86,572	99.1%

Table 1- District wise data

The district wise distribution of COVID-19 cases can be seen from the table represented in Table 1:

As per the reports of ministry, south east, central, north, and west Delhi are the worst affected districts. South east Delhi has the highest number of containment zones in Delhi. Central Delhi holds the highest case fatality rate among all the 11 districts of Delhi. Doubling rate is approximately 10 days in central Delhi and 5 days in north Delhi(13).

Age/sex wise positive case:

The

Table 2 below shows the age wise data:

Table 2- Age wise data

AGE GROUP	PERCENTAGE OF CASES	CASES
0-9	2.5%	2184
10-19	5.0%	4367
20-29	20.8%	18171
30-39	21.9%	19132
40-49	17.6%	15375
50-59	13.5%	11793
60-69	13.2%	11532
70-79	4.3%	3757
80-89	1.1%	961
90-99	0.1%	88

76 per cent of patients with coronavirus were male, 24 per cent were female in India, health ministry said(14).

As per the data collected from the website of ministry of health and family welfare the total confirmed cases till 30th June were 87,360. The reports of ministry shows that the percentage of females infected with virus are 24%, so the total number of females according to the figures of ministry came out to be 20,966 whereas the number males were 76% with total of 66,394.

Calculation of various parameters on the basis of confirmed cases, cured, death and total test done:

Data for Delhi state was examined the from beginning i.e. from the date when first case was detected which was on 2nd March 2020 till 30th June 2020 and on the basis of this data various parameters were calculated .

The calculation of rate of recovery, rate of increase and decrease in regard to previous day, mortality rate, rate of infection, confirmed per million and test done per million people was done using simple formulas. Figures are shown in

Table 3

The total number of confirmed cases till 30th June 2020 are 87,360. According to the data the total number of death till 30th June 2020 are 2,742, number of cured cases are 58,348 and total tests performed are 5,31,752.

Table 3-calculation of various parameters

PARAMETER	FIGURES
Mortality rate	3.14%
Rate of recovery	66.79%
Rate of increase	2.58%
Rate of decrease	-2.58%
Infection rate	0.44%
Confirmed cases per million	4,409
Tests performed per million	26,837

Graphical representation of trend analysis for confirmed cases, cured cases and total deceased cases:

The Figure 1,

Figure 2,

Figure 3 and Figure 4 below represents the trend analysis of cured, death, confirmed cases and for total tests performed.

Figure 1- Trend analysis of cured cases

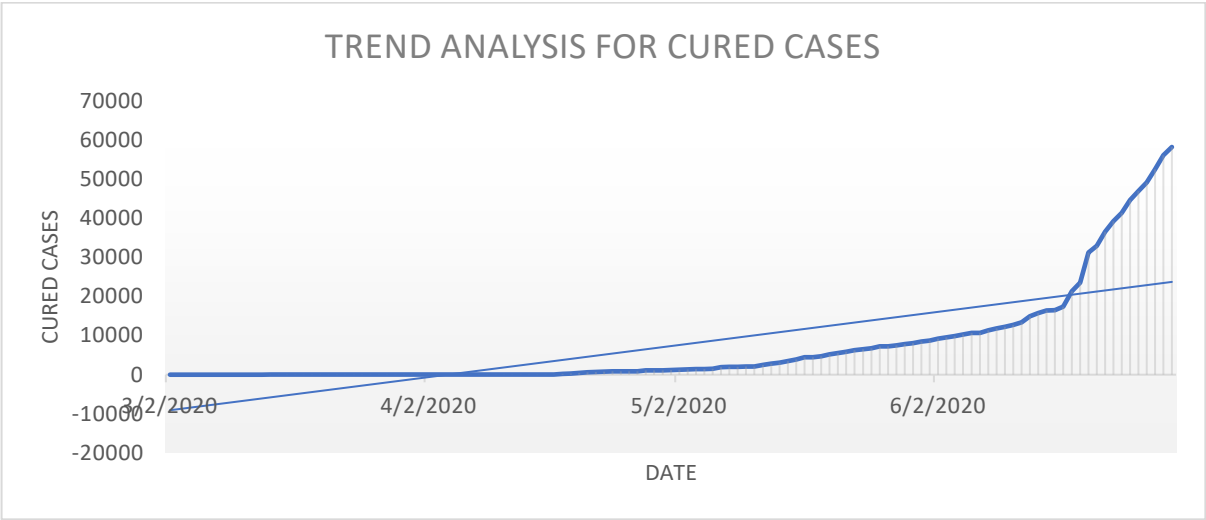


Figure 2- Trend analysis of total death observed

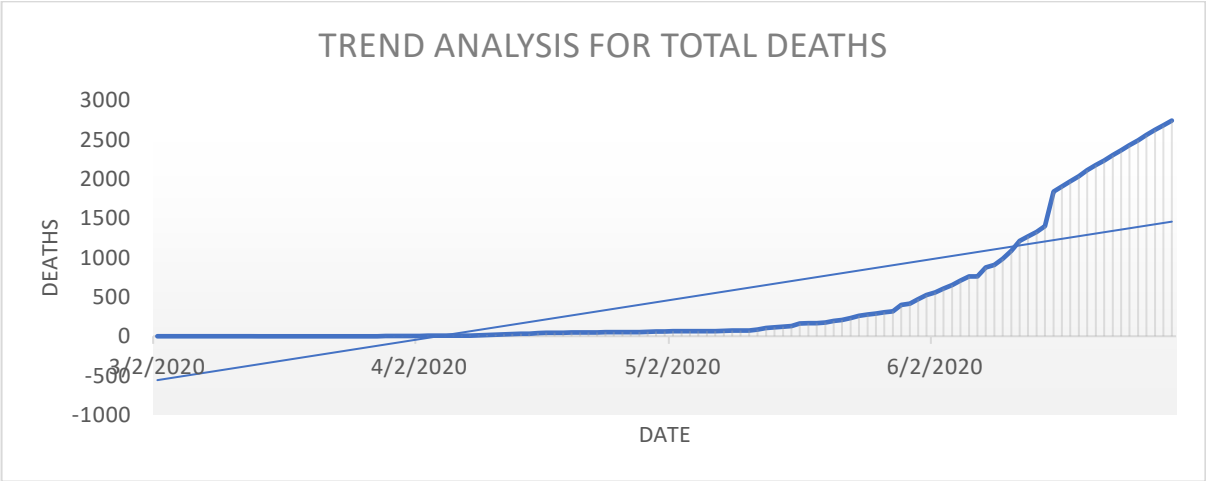


Figure 3- Trend analysis of confirmed cases

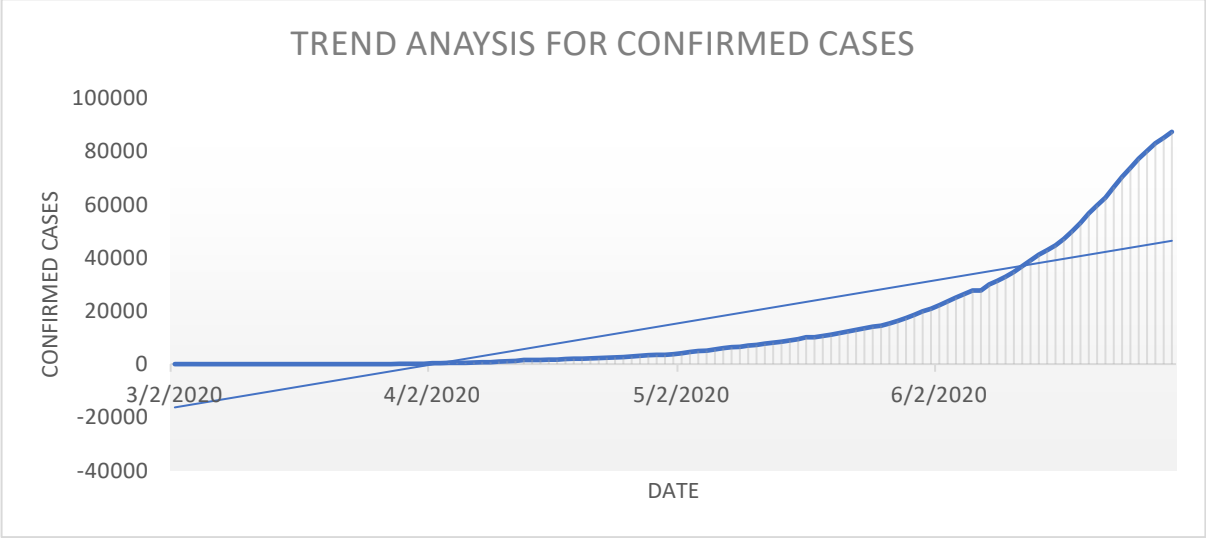
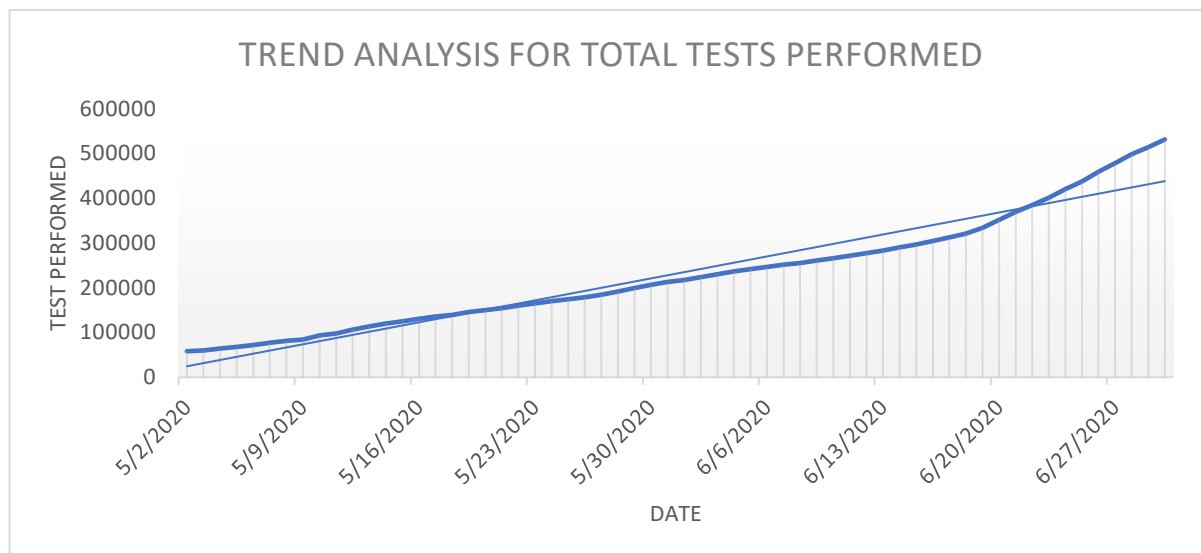


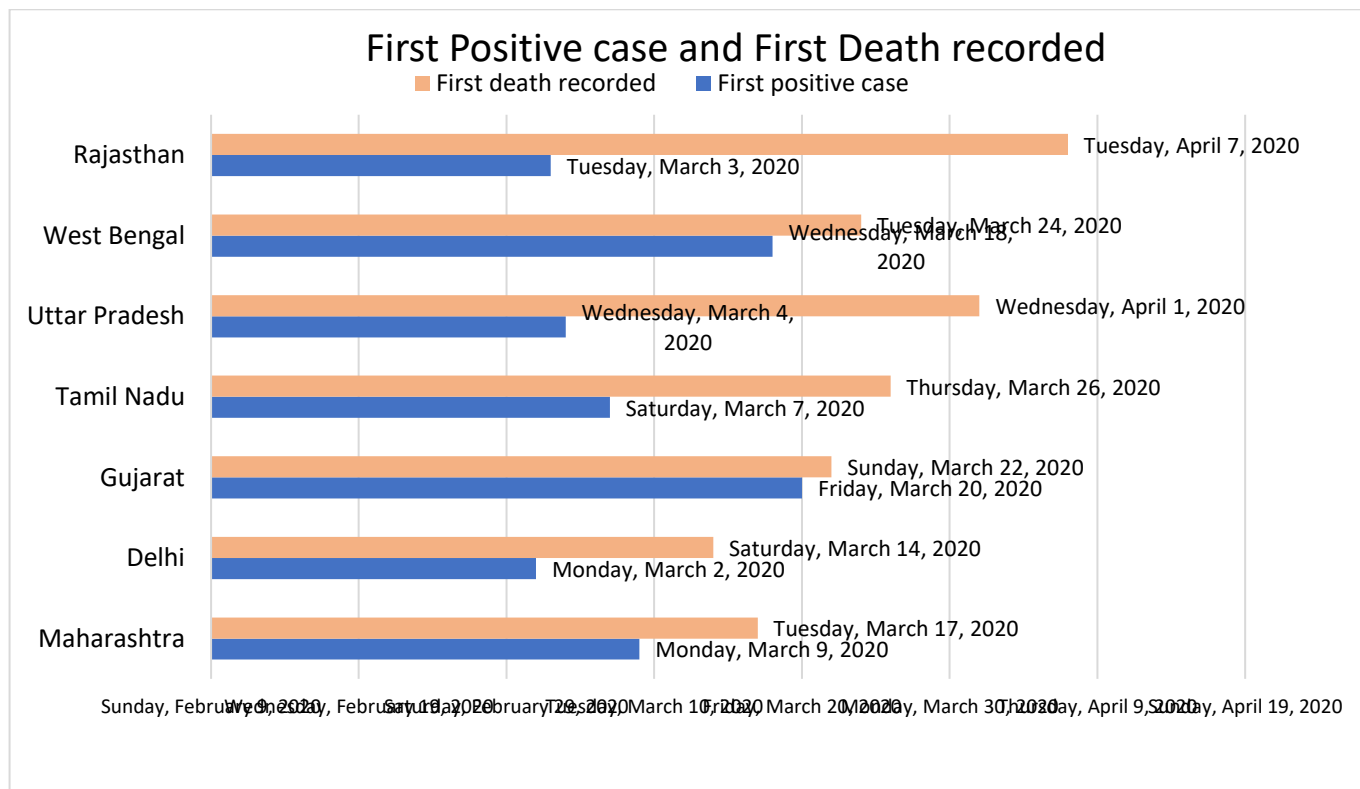
Figure 4- Trend analysis of total tests performed



Comparing Delhi with the worst hit states of India reporting first case and first death:

There are some states which are highly impacted by corona virus and the cases in these states are or peak. Here we have shown the Figure 5 reporting of first case and fatality in the worst hit states of India using graphical representation.

Figure 5-Date of reporting of first case and deceased case



Tests performed in the month of June:

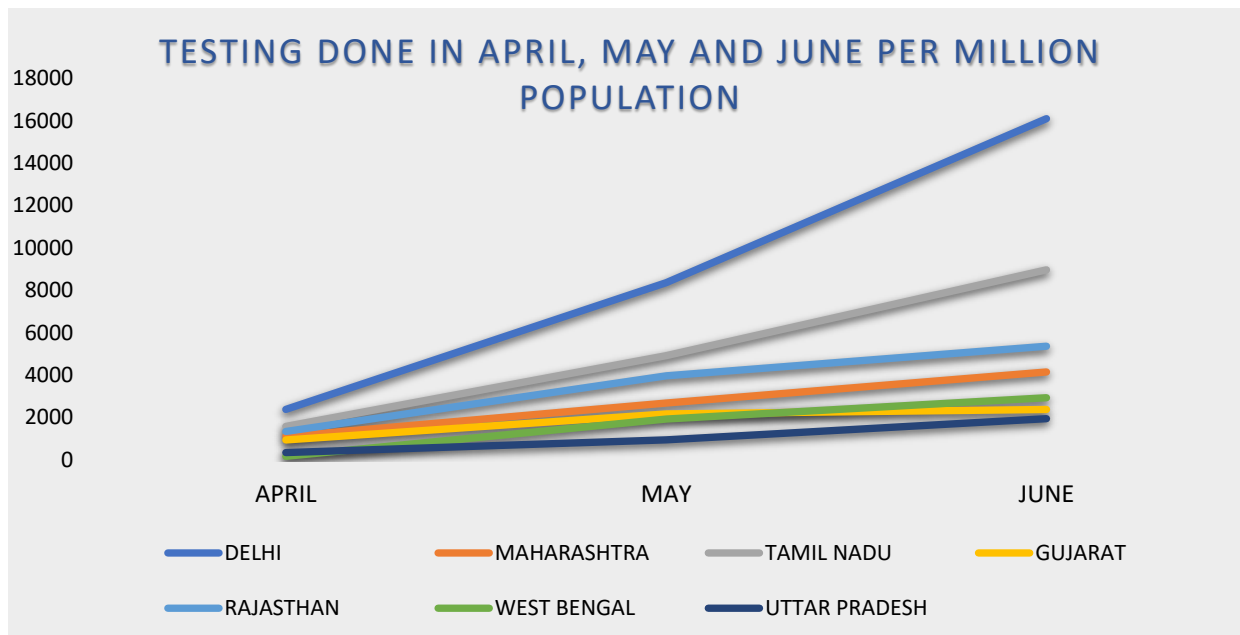


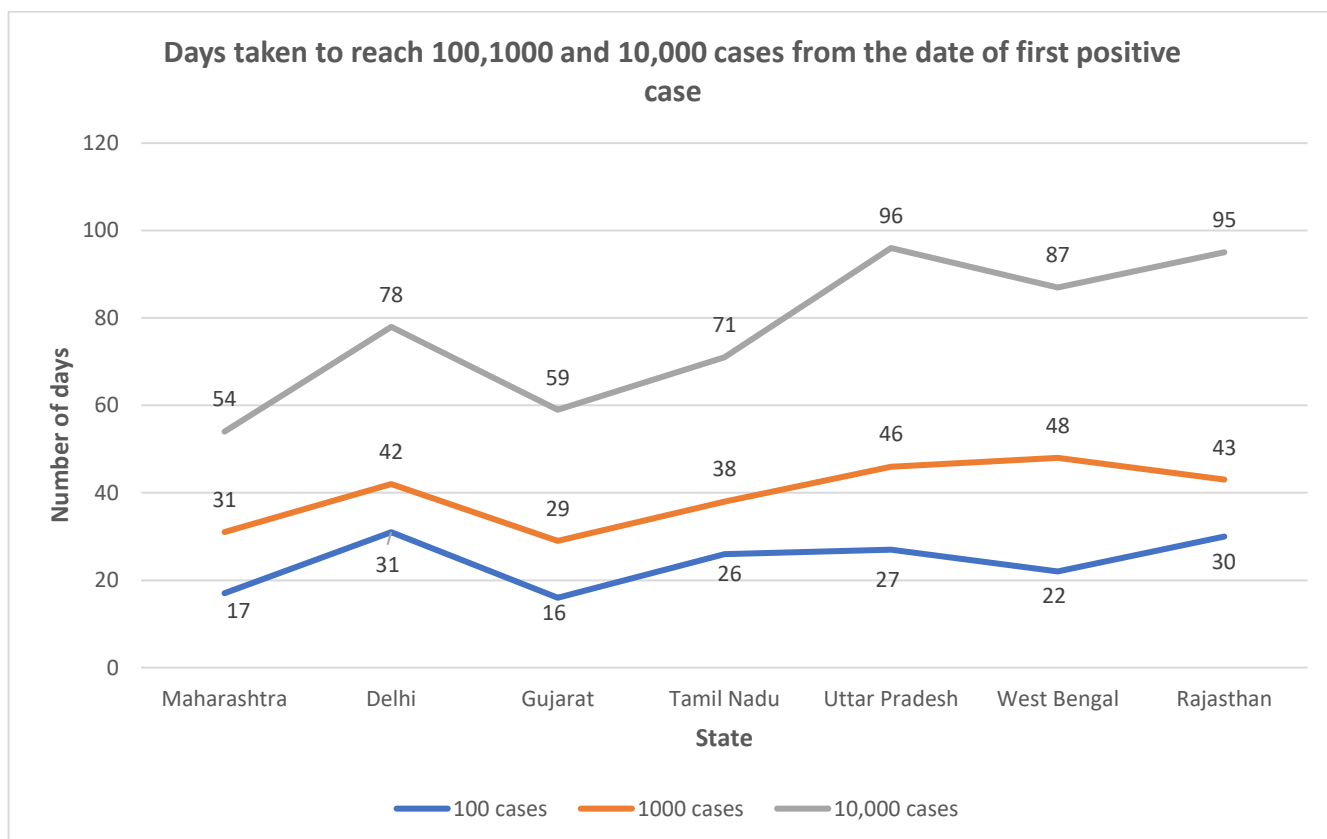
Figure 6- Test performed per million in various months

Figure 6 represents the test performed per million by various states in the month of April, May and June.

Comparison between different states regarding days taken to reach first 100,1,000 and 10,000 cases:

From the date of first corona case, Delhi reported its first 100 cases in 31 days, 42 days for 1000 case and 78 for 10,000 cases, In India Maharashtra and Gujarat were the states to reach the 10,000 cases the earliest. In Maharashtra it took just 54 days and in Gujarat it took 59 days to reach 10,000 corona cases from the day of first positive case shown in Figure 7

Figure 7-Day taken to reach first 100,1,000 and 10,000 cases



Total cases during different phases of lockdown :

Table 4- Lockdown wise cases

LOCKDOWN DATE	TOTAL CASES	PERCENTAGE
25th March-14th April 2020	1,531	1.75%
15th April-3rd May 2020	2,988	3.42%
4th May-17th May 2020	5,505	6.30%
18th May-31st May 2020	9,790	11.21%
1st June-30th June	67,516	77.31%
TOTAL	87,330	

This Table 4- Lockdown wise cases Table 4 represents the number of cases in different phases of lockdown and reopening.

DISCUSSIONS

The existed COVID-19 data was used to check the spread of corona virus among people of Delhi. It was recorded from the official website of ministry of health that the total cases in capital of India are 87,360 and the worst affected districts in Delhi were observed to be South, West and Central Delhi. Approximately 99.1% of the cases in Delhi were unknown from the beginning itself as when Delhi was in early stage of disease most of the cases were recorded from the migrants which landed up in Delhi from various parts of countries to attend

one religious gathering. When age wise analysis was done it was seen that in India or Delhi elderly age group contributes very less to this pandemic unlike other countries where the most affected age group was 50+. Here most of the cases i.e. 60% of them has been found in the people of age group 10-50. Age-wise study of coronavirus patients in India, the Ministry of Health says, it was found that 42 per cent of them belong to the age group of 21-40. The next most affected age group with 33 per cent is those between the ages of 41 and 50. The highest risk group for viral infection, senior citizens (60 +), make up 17 percent of the Covid-19 patient population in India. Just 9 per cent of those under the age of 20 were found positive for coronavirus, the health ministry said. Young Indians are more likely to develop the disease as 83% of patients are below 50 years of age (

Table 2)(15).

Now the percentage of people infected in different age groups and the figures according to those percentage are as follow, in age group 0-9, 2.5% of total infected cases lie with figure turn out to be 2,184, age group 10-19 comprises of 5.0% with 4,367 cases, 20.8% cases in 20-29 age group with figures of 18,171, 30-39 is the age group with highest number of cases 19,132 that means total percentage of 21.9, people in age group 40-49 constitute 17.6% of total cases with 15,375 case. Age group 50-59 and 60-69 has almost same percentage i.e. 13.5 and 13.2% with 11,793 and 11,532 cases respectively, 70-79 age group has 4.3% of infected cases with total number 3,757. Now the groups with lowest percentage are 80-89 with 1.1% (961 cases) and 90-99 with 0.1% (88 cases). Females were observed to be less affected as compared to males(76%).

Various essential parameters were calculated using data of confirmed, cured and death cases till June 30th. The mortality rate was determined on the basis of deaths and reported cases, by dividing total deaths with a total number of confirmed cases. The mortality rate was 3.14 percent when calculated. Rate of recovery was figured out by dividing total cured cases with that of confirmed cases. Till 30th June the rate was 66.79%.

For rate of increase and decrease with respect to previous day first increase and decrease was calculated. For rate of increase the increase was estimated by subtracting new number with original number and vice versa for estimating decrease. The total rate of increase was determined by dividing increase with original number and the same for rate of decrease, i.e. decrease divided by original number. For increase rate the measure came out to be 2.58% and for decrease rate the measures were -2.58%(negative means that there has been increase).

Infection rate was evaluated by dividing total confirmed cases with total state population which is 1,98,14,000. Till 30th June the infection rate was 0.44%. Confirmed per million cases were estimated by dividing confirmed cases by total of state population and multiplying it by 1 million. The total confirmed per million for 87,360 cases were 4,409 case whereas test per million was measured by dividing total test done in state which were 5,31,752 with that of total population and multiplying that with 1 million. The total per million people which came out be 26,837 tests.

Figure 1,

Figure 2,

Figure 3 and Figure 4, shows the trend analysis, an upward trend has been observed. As the number of cases has increased gradually, the number of cured cases have also increased. The cured cases are almost doubled($n=58,348$) as that of active cases($n=26,270$) which is a sign of relief and represents the effectiveness of Delhi's healthcare.

Figure 5 shows the reporting of first case and first observed death among the various worst hit states of India. In India, Kerala was the first state to report a COVID-19 case slowly and gradually got control of corona virus. Delhi is the one which reported the first case on 2nd march 2020 which is the earliest with regard to other states and the first death occurred on 13th day from the day of reporting of first case. After Delhi is Rajasthan who reported its first case on march 3rd, but the time period between the first case and fatality is long as compared to Delhi i.e. 36 days. In present scenario Maharashtra is the state with highest number of COVID cases. Maharashtra recorded his first case on 9th march and first fatality occurred on 17th March. Gujarat was the state who recorded it first case in the last when compared to these seven states i.e. on 20th march and the gap between first case and the first case fatality was just 2 days which is the least.

Figure 7 represents the comparison between different states has also been shown regarding the days taken to reach first 100, 1,000 and 10,000 cases. It was seen that Delhi was the only state among the top four highest case reporting states in which 10,000 cases took around 2.5 months to occur. Whereas Maharashtra who is currently on top with more than 1.5 lakh cases reached to 10,000 cases in just 54 days i.e. less than 2 months and the same figures goes for Tamil Nadu which presently has almost same number of confirmed cases as that of Delhi. Gujarat also 10,000 cases appeared in 2 months ($n=59$ days).

From Figure 6 it can be seen that highest number of tests per million has been performed by Delhi and after that by Tamil Nadu which has almost equal number of confirmed cases as that of Delhi till 30th June. The lowest test per million is done By Uttar Pradesh which has the highest population among all the seven states. Apart from this it can be seen that the testing rate has increased with increase in time.

In addition to this Table 4 presents the different figures of confirmed cases that appeared during different phases of lockdown. It was noted that with increase in lockdown phases the number of cases also increased as there were some relaxations provided to inhabitants with change in every phase. But in the last phase of lockdown which was also referred to as unlock 1 the cases took a rise to increase to more than double. Around

77.3%(n=67,516) cases were seen during the reopening phase of lockdown and this may be due to the relaxations and reopening of religious places, ,malls and other public gathering places.

Moreover, an additional information has been mentioned below (Table 5,Table 6) showing the number of hospitals dedicated to COVID, number of beds with and without ventilators, various measures taken to increase the strength of beds and testing, advisories and policies released on different dates, and rules and regulations adopted by the government of Delhi to tackle with this pandemic.

Preparation and steps taken by Delhi government:

OWNERSHIP	NUMBER OF HOSPITALS	TOTAL COVID-19 BEDS	ICU BEDS WITH VENTILATOR	ICU BEDS WITHOUT VENTILATOR
Delhi Government	5	4137	185	1
Central Government	5	2022	185	18
Private	114	7353	400	876
TOTAL	124	13512	770	895

Table 5-Total hospitals and beds

The data shown in Table 5 is collected from the official mobile application with name Delhi Corona which is developed by government of Delhi. this application tells the availability, occupancy, total bed, ICU with ventilators and without ventilators, total containment zones and hotspots and also an helpline number is provided through which queries related to corona are being solved. Moreover you can also check the status of your health on this help. With respect to data present on this application the total number of hospital dedicated to COVID are 124 as of 30th June, out of which 5 are under Delhi government, 5 under central government and 114 are private. Total number of beds present for covid in these hospitals are 13,512 whereas ICU bed with ventilators are 770 and without ventilators are 895.

Apart from this various play grounds, stadiums and banquet halls are being converted to covid centres for the treatment of patients. Recently 10,000 bed are being installed in Radha Swami Satsang beas centre which is in Chhatarpur and is spread over 70 acres of land. The bed installed are biodegradable with oxygen facilities, wheelchair for people with disabilities, urinals and bathing rooms.

Moreover, on 29th June 2020,the Chief minister of New Delhi has announced the opening of Delhi's first plasm bank in Institute of liver and biliary sciences which an reputed hospital in Delhi.

Various policies and advisories enacted by Delhi government amid pandemic:

DATE	POLICIES	ADVISORIES
08 March 2020		First travel related advisory (regarding awareness while travelling).
12 March 2020	Complete shutdown of educational institutes, swimming pools and movie theatres	Advisory regarding closure of all education institutions, Social distancing related advisories like closure of swimming pools, cinema halls and other preventive advisories
13 March 2020	Restricted ban on sports events and gatherings	Advisory regarding suspension of all sports gathering

14 March 2020		Advisory regarding social distancing: suspension of all types of public gatherings
16 March 2020	Restricted ban on public events and gatherings	
19 March 2020	Complete shutdown of educational institutes and partial shutdown of work places	Advisory for business and economy: work from home
20 March 2020		Advisory regarding social distancing: closure of all shopping malls
23 March 2020	Lockdown begins	Announcement regarding complete state lockdown, suspension of all type of domestic and international travel
01 April 2020		Advisory for employees: insurance schemes for health workers working during the times of COVID-19
08 April 2020		Advisory regarding preventive measures: wearing of masks
14 April 2020	Lockdown extended	Advisory regarding travel i.e. issue of e-pass for travelling within state, extension of lockdown
17 April 2020		Additional actions like circulation of WhatsApp numbers for receiving complaints and queries regarding the pandemic
24 April 2020	Updated screening steps	Advisories regarding screening of migrant workers, labourers, Guidelines regarding management of dead bodies
28 April 2020		Orders for all the testing laboratory for providing all the reports of the patient to the integrated disease surveillance program through emails, orders regarding issue of unique codes for tracking patient
13 May 2020	Updated surveillance steps	
16 May 2020		Adding new private hospitals to the list of covid dedicated hospitals
27 May 2020	Testing criteria updated	New guidelines regarding testing criteria, and sample collection
29 May 2020		Orders for turning hotels into covid facilities
07 June 2020	Reopening starts	Reopening of state boundaries
16 June 2020	Installation of cameras in COVID hospitals	CCTV installation in hospitals
19 June 2020	Plans to run six lakh rapid tests	Increased number of testing
25 June 2020	Banquet halls are being converted	Orders to begin serological survey, banquet halls are being converted in covid facilities
27 June 2020	closure of educational institutions till 31st July 2020	Serological survey begins, Educational institutions to remain close till 31st July
29 June 2020		orders regarding setup of plasma bank in state

Table 6-Advisories and policies

Rules and relaxations during first lockdown (25th march to 14th April 2020):

1. people working in private sector and are engaged in essential services would only be allowed if their organisation will issue curfew passes to them.
2. government employees with working offices will be allowed but they should carry their identity card.
3. employees of private organisations and if that organisations are linked with government organisations then the employees will be allowed with identity card and authorisation issued by that government agency.
4. police officials will be doing patrolling on motorcycles to ensure that no violates the rules of lockdown.

Rules and relaxations during second lockdown i.e. from 15th April to 3rd may 2020:

The sectors which will start functioning:

1. In financial sector the banks, ATMs and other things which comes under RBI will start.
2. In social sector the old age homes for elderly, disbursement of pensions and fund by employees provident fund organisation.
3. Internet, telecom, power and postal services will resume
4. Organisations to maintain sanitisation of workplace before and after shifts.
5. Parents who have children below 5 years and people of 65 years and above are requested to work from home.
6. Farming operations, shops associated with farming machinery and material, APMC mandis, plantation of tea and coffee, and animal husbandry along with its distribution.
7. Cargo services, carrier vehicles are allowed with 2 drivers and 1 helper.
8. Wholesale and retail shops, highway dhabas and mechanic shops are allowed to start their functioning.
9. Export oriented units, coal and mineral production, industries in rural areas and all other types of industries under municipalities , food processing units, jute industries and construction activities will function.
10. All type of medical services and movement of medical staff is permitted.
11. In private vehicle four wheeler is allowed with one drive and one more person on back seat and in two wheeler only driver is allowed.
12. IT sector is allowed to resume with fifty percent strength, call centres for government activities, and e commerce companies will operate.
13. Spitting and gathering of more than 5 persons in public place is prohibited, marriages and funeral activities will be done under the permission of DMs, strict ban is imposed on the sale of alcohol and other chewable tobacco.
14. For COVID 19 hotspots these no exemption is given, inward and outward movement is strictly prohibited even after 20th April.

The sectors which will not start function:

1. All type of public transportation and air travels.
2. Hospitality services and educational institutions.
3. Gyms, movie theatres, assembly halls and entertainment parks.
4. Religious places, sports grounds and complexes. (Information from mygov.in)

Lockdown 3.0 has been introduced in India but with different relaxations in different areas according to the status of the covid-19 in that area. the following relaxations has been given to Delhi so far (all the districts of Delhi are in red zone)(4th may to 17th may 2020)

1. Transportation system like buses, Delhi metro, and flight travels has not been given any relieve and is still suspended.
2. Essential goods can be delivered through e -commerce.
3. Salons, movie theatres, shopping malls will remain shut.
4. Delhi private offices will continue their work with total of 33% strength and government offices with full strength.
5. Information technology services and call centres will start.
6. Gatherings like wedding with 50 people and funeral with 20 attendees will be allowed.
7. Private vehicles such as two wheeler can run with only one person and four wheeler with one driver and two persons apart from driver will allowed.
8. Halt on religious gatherings and places will continue.
9. Pregnant women, children's of age below 10, elder of age 65 and above and people with chronic diseases like diabetes, hypertension etc are not allowed to step out of doors.
10. People like plumber, electricians who are self-employed can work.

Lockdown 4.0 has been initiated around the country with new set of rules and regulation. the date for lockdown is 18th may to 31st may 2020.

Services which are prohibited:

Metro rail services, shopping malls, all type of educational institutions, religious places, hotels, bars and restaurants, barber and salon, carpooling is not allowed, moving out of the home from 7pm to 7am is not allowed except for the essential services.

Services which are allowed:

Home delivery of food restaurants, all types of rickshaws with one passenger only, cabs and other taxi services with 2 passengers, sports can be played in stadiums but without spectators, small buses i.e. RTV buses with 11 passengers, 33% staff restriction has been removed from all type of offices, construction will be allowed but no outside labourers are allowed only labourers from Delhi can work, shops in market can open on odd even basis.

Lockdown 5.0/unlock 1.0 (1st June 2020 to 30th June 2020):

This lockdown has three phases:

- 1st phase: shopping malls, religious places, restaurants and hotels will be allowed to continue after 8th June.
- 2nd phase: decision regarding opening of educational institutions will be taken in July according to the situation.
- 3rd phase: opening of international flights, gyms, sports and cultural activities and movie theatres will be decided depending upon the situation.

1. Specials trains are allowed to run

2. Movement from 9pm to 5am is prohibited
3. Lockdown has been extended till 30th June for areas under containment.
4. Interstate and intrastate travelling is allowed with some restrictions.

Best practices adopted:

1. Converting various stadiums and banquet halls in COVID facilities.
2. Opened plasma bank in ILBS hospital, for plasma therapy treatment of COVID patients.
3. Installed CCTV cameras in all COVID dedicated hospitals .
4. Started serological surveys.
5. Installed tablets in the wards of LNJP hospital which helps patient to interact with their relatives through video conferencing.
6. Provided pulse oximeters to those under home isolation.

CONCLUSION

It can be concluded from the observational study that as the days are passing, havoc to human life due to this deadly virus is increasing. Delhi government is taking necessary steps to control the spread of COVID-19 in community. Delhi is under lockdown since 25th March 2020 and now reopening phase has been started.

1. The current recovery rate is more than 65% in Delhi which means 65 people out of 100 are getting cured and also recoveries have exceeded the figures of active cases.
2. The major sign of worry is the increasing trend of confirmed cases though the necessary steps are being followed but the increasing rate is not declining.
3. The tests done are the highest when compared to per million population.
4. Non-Pharmacological remedies like personal hygiene methods like hand washing, coughing into tissue or elbow, social distancing and avoiding unnecessary touching of eyes, nose, mouth and other body parts from which corona virus can enter the body are being followed.
5. Quarantine method is being followed by people who are in close contact with infected cases.

The need of a situation is that everyone should follow guidelines provided by government and health department and should take necessary precautions in order to eliminate this virus not only from state but also from country. As per the recent scenario we can say that time will address us regarding further outbreak and how it will be tackled.

CURRENT RULES AND REGULATIONS BY DELHI GOVERNMENT

- Imposing of penalty on violation of quarantine rules, wearing of mask etc.
- Order to carryout compulsory Rapid antigen detection testing for high risk group of individuals.
- Order fixation of COVID RTPCR test rate at Rs 2400.

- Order creation of hospital beds for COVID-19 in Banquet halls in all districts

RECOMMENDATIONS

1. Delhi government should start random testing and immediate contact tracing should increase.
2. No more relaxations should be provided in reopening phase until at least mid-august (as cases have increased in unlock 1).
3. Strict rules regarding social distancing, at least 3 feet distance between individuals at shop.
4. Number of plasma banks can be increased.
5. Just like LNJP hospital tablets can be installed in other hospitals so that family members can meet their loved one virtually which will also decrease the risk of infection to them.

LIMITATIONS

1. There have been claims of underreporting of cases and death.
2. It is all based on numbers and the actual figures may vary and conditions may improve or deteriorate depending on the initiatives and steps taken by the government.

REFERENCES

1. Huang, C., Wang, Y., Li, X., Ren, L., Zhao, J., Hu, Y., Zhang, L., Fan, G., Xu, J., Gu, X., Cheng, Z., Yu, T., Xia, J., Wei, Y., Wu, W., Xie, X., Yin, W., Li, H., Liu, M., Xiao, Y., Gao, H., Guo, L., Xie, J., Wang, G., Jiang, R., Gao, Z., Jin, Q., Wang, J. and Cao, B., 2020. Clinical features of patients infected with 2019 novel coronavirus in Wuhan, China. *The Lancet*, 395(10223), pp.497-506.
2. Centers for Disease Control and Prevention. 2020. *Coronavirus Disease 2019 (COVID-19)*. [online] Available at: <<https://www.cdc.gov/coronavirus/2019-ncov/index.html>> [Accessed 22 July 2020].
3. Zhu, N., Zhang, D., Wang, W., Li, X., Yang, B., Song, J., Zhao, X., Huang, B., Shi, W., Lu, R., Niu, P., Zhan, F., Ma, X., Wang, D., Xu, W., Wu, G., Gao, G. and Tan, W., 2020. A Novel Coronavirus from Patients with Pneumonia in China, 2019. *New England Journal of Medicine*, 382(8), pp.727-733.
4. En.wikipedia.org. 2020. *Coronavirus Disease*. [online] Available at: <https://en.wikipedia.org/wiki/Coronavirus_disease> [Accessed 22 July 2020].
5. Fehr, A., Channappanavar, R. and Perlman, S., 2017. Middle East Respiratory Syndrome: Emergence of a Pathogenic Human Coronavirus. *Annual Review of Medicine*, 68(1), pp.387-399.
6. Who.int. 2020. *Statement On The Second Meeting Of The International Health Regulations (2005) Emergency Committee Regarding The Outbreak Of Novel Coronavirus (2019-Ncov)*. [online] Available at: <<https://www.who.int/news-room/detail/30-01-2020-statement-on-the-second-meeting->

of-the-international-health-regulations-(2005)-emergency-committee-regarding-the-outbreak-of-novel-coronavirus-(2019-ncov)> [Accessed 22 July 2020].

7. Npr.org. 2020. *NPR Choice Page*. [online] Available at: <<https://www.npr.org/sections/goatsandsoda/2020/03/11/814474930/coronavirus-covid-19-is-now-officially-a-pandemic-who-says>> [Accessed 22 July 2020].
8. Moneycontrol. 2020. *Coronavirus News India Highlights: Death Toll Due To COVID-19 Rises To 35, Cases Increase To 1,397*. [online] Available at: <<https://www.moneycontrol.com/news/india/coronavirus-news-india-live-updates-covid-19-pandemic-us-italy-maharashtra-kerala-death-toll-statewise-tally-lockdown-news-5089281.html>> [Accessed 22 July 2020].
9. Gupta, N., Praharaj, I., Bhatnagar, T., Thangaraj, J., Giri, S., Chauhan, H., Kulkarni, S., Murhekar, M., Singh, S., Gangakhedkar, R., Bhargava, B. and Team, I., 2020. Severe Acute Respiratory Illness Surveillance For Coronavirus Disease 2019, India, 2020. [online] Ijmr.org.in. Available at: <<http://www.ijmr.org.in/article.asp?issn=0971-5916;year=2020;volume=151;issue=2;spage=236;epage=240;aulast=Gupta>> [Accessed 22 July 2020].
10. Gupta, N., 2020. [online] Available at: <<https://www.monaldi-archives.org/index.php/macd/article/view/1294>> [Accessed 22 July 2020].
11. Kaushik, S., Kaushik, S., Sharma, Y., Kumar, R. and Yadav, J., 2020. The Indian perspective of COVID-19 outbreak. *VirusDisease*, 31(2), pp.146-153
12. India Today. 2020. *Young Indians Comprise More Than Half Of Confirmed Covid-19 Cases*. [online] Available at: <<https://www.indiatoday.in/diu/story/coronavirus-india-young-patients-age-groups-covid19-1662698-2020-04-03>> [Accessed 22 July 2020].
13. The Indian Express. 2020. *Covid-19: Three Delhi Districts Emerge As Worry In Centre Assessment*. [online] Available at: <<https://indianexpress.com/article/cities/delhi/three-delhi-districts-centre-assessment-coronavirus-6397575/>> [Accessed 22 July 2020].
14. The Hindu. 2020. *Data | COVID-19 Has Affected Higher Share Of Men In India, Difference Relatively Lesser In Other Countries*. [online] Available at: <<https://www.thehindu.com/data/data-covid-19-has-affected-higher-share-of-men-in-india-difference-relatively-lesser-in-other-countries/article31561913.ece>> [Accessed 22 July 2020].
15. India Today. 2020. *83% Of India's Coronavirus Patients Are Below The Age Of 50: Health Ministry Data*. [online] Available at: <<https://www.indiatoday.in/india/story/83-of-india-s-coronavirus-patients-are-below-the-age-of-50-health-ministry-data-1663314-2020-04-04>> [Accessed 22 July 2020].

PART-2

Name of the course:

Understanding Clinical Research: Behind The Statistics (24 hours)

By: University of Cape Town

Course Description:

This course is perfect for the ones who always skip the result section of a research paper due to difficult terms like t test, p value, chi square, as they go over their head. This course can be the initial step if someone is trying to understand the published literature or is writing or conducting the research. This course provides the understanding of statistical concepts without using the complicated mathematical equations. It also provides easy understanding of concepts related to clinical research. Through this, one can Understand the statistical approaches used by researchers to interpret their data which leads to key determination of validity of the research results. This program is provided by University of Cape Town on an online platform known as Coursera.

The duration of this program is 6 weeks (2–3 hrs per week) which ensures an easy understanding and interpretation of common statistical approaches. The program will provide information on types of clinical studies and the different forms of data that can be obtained using them and also Confidence level and interval, parametric and nonparametric test, hypothesis testing etc

Course objectives:

- Defining study types
- Describing your data
- Building an intuitive understanding of statistical analysis
- Hypothesis testing and confidence levels
- Which test should you use?
- Categorical data and analysing accuracy of results

Learning methodology used in the course:

- Videos
- Readings materials
- Power point presentations

Course content:

S. No	Week	Content	Page no.
A	Week 1: Describing various stud designs and its types	1. Observational study design. 2. Various types: 3. Experimental study design 4. Defining Systematic review and Meta-analysis	25-26
B	Week 2: Describing your data	1. Some key definitions 2. Types of data 3. Categorical data 4. Numerical data 5. Describing discrete and continuous data types 6. Measures of central tendency 7. Measures of dispersion 8. Sampling 9. Types of sampling	26-28
C	Week 3: understanding different tests and theorems for statistical analysis	1. P-values 2. Rolling dice 3. Continuous data types 4. Central limit theorem 5. Skewness and kurtosis 6. Describing various types of distribution 7. Z distribution 8. T distribution	28-30
D	Week 4: Testing hypothesis and describing confidence levels	1. Hypothesis testing and its types 2. Two-tailed test 3. One-tailed test 4. Errors in hypothesis testing 5. Types of error 6. Defining confidence levels and Confidence intervals	30-31
E	Week 5: Type of test to be used	1. Introduction to parametric test and its types 2. Some key concepts and introduction to Nonparametric tests	31-32
F	Week 6: Describing Categorical data and	1. Using different tests to compare categorical data 2. Defining sensitivity and specificity 3. Predicted values	32-33

	various test to analyse accuracy of the results		
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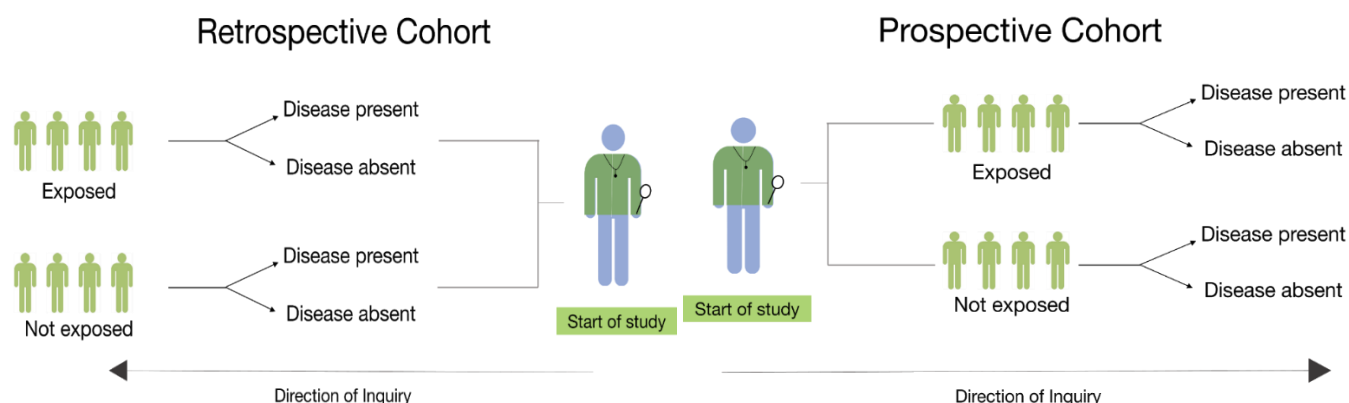
KEY LEARNINGS FROM DIFFERENT MODULES:

Week 1:

1) Types of study design:

Observational studies are of four types:

First is case series which is the simplest form of study design. In this we simply have to describe what we have observed in a group of subjects. Second is case control in which two groups are selected. One act as case (presence of outcome or diseased group) and other act as control (absence of outcome or non-diseased group). It is a retrospective study i.e. we look back at times to determine the variables and risk factors that differ in both the groups. Third is the cross sectional study. One of the example of this is epidemiological surveys. Cross sectional study is an observational study which at a point of time analyses the data from the population (not going forward, not looking backward). Last is cohort study. A prospective study (going forward or following a certain group of people for some years) in which two groups (exposed and non-exposed) of subject with unknown outcomes are compared. It can retrospective also in which the outcome has already occurred and we are looking for cause by going backward.



Experimental studies include randomisation to remove bias that means selecting individuals randomly by assigning them with a number so that everyone has equal chance of getting selected. Other process to remove bias is blinding which indicates that participant should not know if they are receiving an actual treatment or placebo treatment whether they are a part of control group or experimental group. There are different types of blinding depending upon who will be become the part of blinding.

Self-control : Patient act as his or her control, we collect data before intervention and again we collect the same data after intervention.

Cross over trials: In this we have two sets of patients, one with placebo drug and other not with actual drug. They are each going to be their own controls so we do same studies before and after the intervention and after certain period of time we will swap them.

External control: It is important if no treatment in an certain area existed before we did this trial. For instance historical control.

Uncontrolled trials: Here we are just looking at variations and outcomes and you will form the groups based on those.

Meta-analysis: It is an outcome of systematic reviews and it is an statistical process to develop an overall conclusion using studies which exist previously (with similar investigation) and also by combining the statistical inferences of those studies.

Systematic review: It is a process which include determining a question, setting an inclusion and exclusion criteria, finding, selecting, appraising and synthesising the literature.

Week 2:

Some key definitions:

Descriptive statistics: when the statistical tool is used to describe and sum up a data set.

Inferential statistics: In this the investigation is done on a specified elements and on the basis of which the conclusions is made about the much larger population (more than the sample size)

Population: A pool of individuals with at least one feature.

Sample: A group of members selected from a population represents a sample.

Parameter: When the values of whole population is studied and the calculations are made, the statistical value that is obtain is called as parameter.

Statistic: When the values of sample is studied and the calculations are made, the statistical value that is obtain is called as parameter.

Variable: The name of the group of data values collected for doing study is refer to as variable.

Data point: A single specific value in data set which describes the data.

There are 2 types of data:

a) Categorical: It include categories and does not include values.

- Nominal categorical data: When the data point is represented in words rather than in numbers or values.
For example: yes or no, male or female

- **Ordinal categorical data**: When the data can be arranged in some order like increasing and decreasing or can be given some ranking. For example: exam score from 1-10.

b) **Numerical**: Data which is expressed in values.

- **Interval**: When the interval or the difference between the values of data set is same. for e.g.: 1-2, 3-4.
- **Ratio**: The type of data which contain a true zero (0).

Discrete and continuous data types: When the clear spaces appears in values, the data is referred to as discrete. For example: while rolling a dice a 5 or 6 can appear but not 5.5. whereas in continuous data a continuous sequence is there. For example: between 1-2, 1.1, 1.2, and so can appear.

Measures of central tendency: There are 3 measures of central tendency:

a) **Mean**: The mean also referred to as the average can be defined as the sum which appears by dividing the sum of all data values by the total number of data values in the dataset.

b) **Median**: The value that appears in the middle of the values of data set is referred to as median.

c) **Mode**: The value with the most frequencies in the data set is referred to as the mode.

Measures of dispersion:

a) **Range**: Range can be defined as the difference between the minimum value and the maximum.

b) **Quartiles**: Quartile divide the values of the data set into four equal parts just like the median which divide the values into two equal parts.

c) **Percentile**

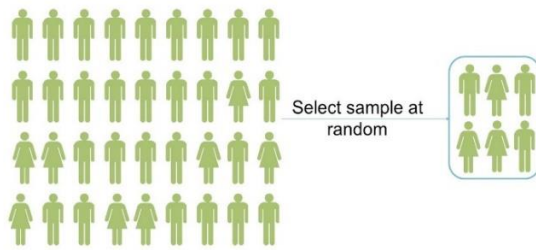
- In this for any percentage of data points a value can be calculated instead of cutting down the values into quarters. Changes the first quartile in 25th percentile, the second quartile in 50th percentile and a third quartile in 75th percentile
- A value can be set in a data set which you study and the value which falls above or below that value can be given some percentile rank, for example: a value of 50 may be given a percentile rank of 15 that means 15% values in data set are below 50 and 85% are above 50.

d) **The Interquartile Range and Outliers**: Difference between 1st quartile and 3rd quartile values is called interquartile range. An outlier is the value that varies from other values of the data set in the dataset.

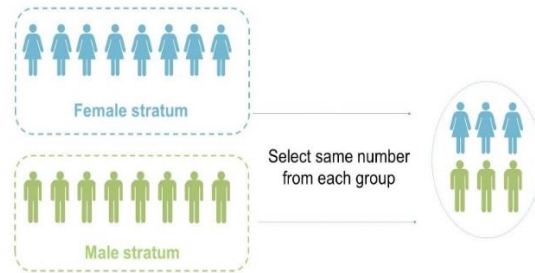
Variance and standard deviation: Variance is the method to describe the dispersion or we can say the spread of data value in a data set with respect to its mean. Standard deviation is obtained by doing the square root of variance.

Sampling: Sampling is a technique of selecting sample from a population. Four types of techniques are:

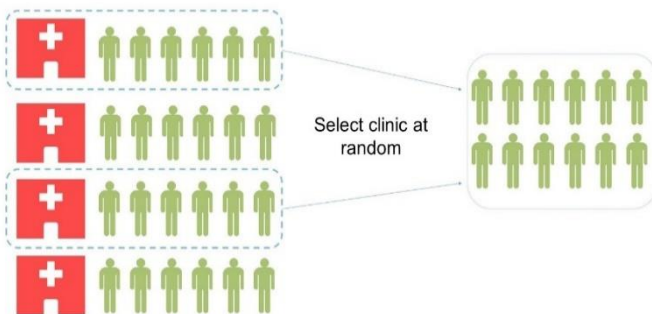
Simple random sampling



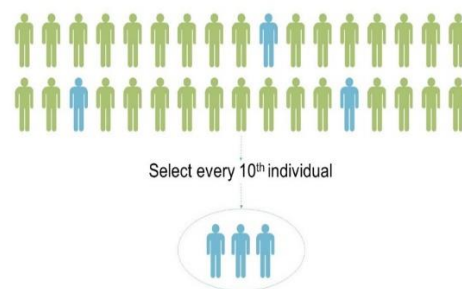
Stratified random sampling



Cluster random sampling



Systematic random sampling



Week 3:

P value: P value is the likelihood of occurring of an event. A simple geometrical curve is drawn and area under that curve is calculated.

Let's take an example of rolling a single and a paired dice:

- Rolling a single dice has the equal probability of producing a number 1,2,3,4,5 or 6.
- Rolling a pair of dice has a total of 36 results and the sum obtained by rolling a pair of dice can range from 2 to 12
- As there are total 6 chances that a sum of 7 will appear when two dice are rolled so we can say the probability of occurring of sum of 7 when pair of dice are rolled is 6 out of 36 outcome.
- Probability of occurring of both face 1 and both face 6 is 1 in 36 outcomes.

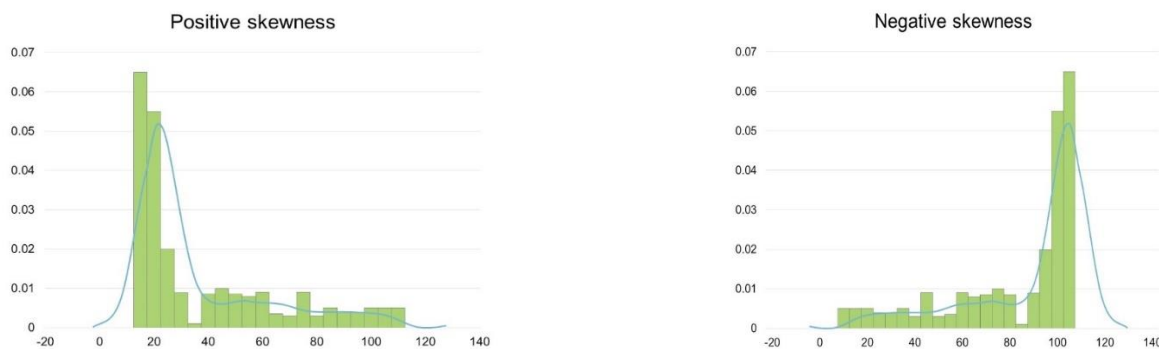
Area under the curve:

Continuous data types - It is difficult to measure the geometrical width of areas of continuous variables as they are infinitely divisible. The width of the base in case of continuous variable is infinitely divisible and no single

value exists as in case of discrete variable and because of this the only question that arises is, Which is the area between two values under the curve or what is the area for value larger or smaller than a given value.

Central limit theorem: CLT is the foundation for parametric hypothesis testing. Understanding this theorem provides knowledge of how to apply inferential statistics to data. According to CLT if we select random samples from any distribution and we calculate mean i.e. the average, then the distribution of that mean will give normal or bell shaped curve. The CLT allows the use of confidence intervals, hypothesis testing, design of experiments, regression analysis, and other analytical techniques on data.

Skewness: Skewness is the changes in the symmetry of normal distribution or bell shaped curve. If the curve is rightly tailed it is positive skewness and if the curve is left tailed it is negative skewness.



Kurtosis: Kurtosis essentially describes the type of tail generated by a curve as a result of the data spread.

- When there are fewer values around the mean and the curve formed is flattened which shows negative kurtosis, this type of curve is referred to as platykurtic curve.
- A mesokurtic curve follows normal distribution and indicated the majority of the kurtosis towards zero
- When many values are centred around the mean the leptokurtic curve is formed which is more peaked.

Normal distribution: Normal distribution is sometimes referred to as the gaussian curve or bell-shaped distribution. The symmetry is equal on both left and right side of the curve and the area below the curve represents the probability.

Sampling distribution: The distribution of the values or the statistics obtained by sample or a population is referred to as sampling distribution. Basically it is done to the distribution of frequencies of range of outcomes in sample collected from a population. The various steps involved in this are first select a sample randomly from a population second is to calculate the statistics i.e. mean and last is to plot the statistics in frequency distribution.

The Z-distribution: It is a type of standard normal distribution which act as standard for calculating other normal distribution. It is used to calculate the percentiles and to find the probability of normal distribution. The mean of z distribution is 0 and standard deviation is 1.

t-distribution: t distribution is a type of sampling distribution method that is commonly used to calculate population parameters. It is used when the population size is less or small and the variance or standard deviation is unknown.

Week 4:

Hypothesis testing: Hypothesis is basically an assumption which statistician make about the population parameters. That assumption can be true or can be false. Hypothesis testing is performing the specific tests to check whether the assumptions made are true or false. There are two type of hypothesis testing.

The null hypothesis: The most important thing while performing the research is that researcher should remain unbiased towards the outcome and the work he/she is performing. The name null itself means no that is we should consider that there is no difference when any comparison is done in done or there is no effect of one variable on the other. It is represented as H_0 . If there is no difference or no comparison then null hypothesis is accepted other hypothesis is rejected.

The alternative hypothesis: The alternative hypothesis means that there is a difference between the variables or one variable is affecting the other. It is represented as H_a . If any difference is actually found then the alternative hypothesis is accepted and the null hypothesis is rejected because it says no difference.

The two-tailed test: When we have to test null hypothesis (meaning no difference) or non-directional hypothesis (that is there is difference but it is not telling what kind of difference it is whether positive or negative) we use two tailed test. There is any difference or not without any concerns of signs.

One tailed test: If it is said that in two groups one mean is more and other is less.

Type 1 and type 2 error:

	The null hypothesis is valid	The null hypothesis is invalid
Reject the null hypothesis	Type I error	✓
Fail to reject the null hypothesis	✓	Type II error

Confidence level: The probability with which a true null hypothesis is accepted is termed as confidence level

Confidence interval: Confidence interval is referred to as the accuracy of our estimates. Width of confidence interval depends upon the size of the sample and the variation in the sample. Low variations will occur in the sample which are similar which in turn will leads to narrow confidence interval and vice versa where as small sample gives less information, more variation can occur due to sampling error but this can be lessen by

increasing sample size as they are more similar to each other and small error is overlooked. More information can be obtained when the sample is larger and through this more surety can be gained about the estimates and the confidence interval can be smaller.

Week 5:

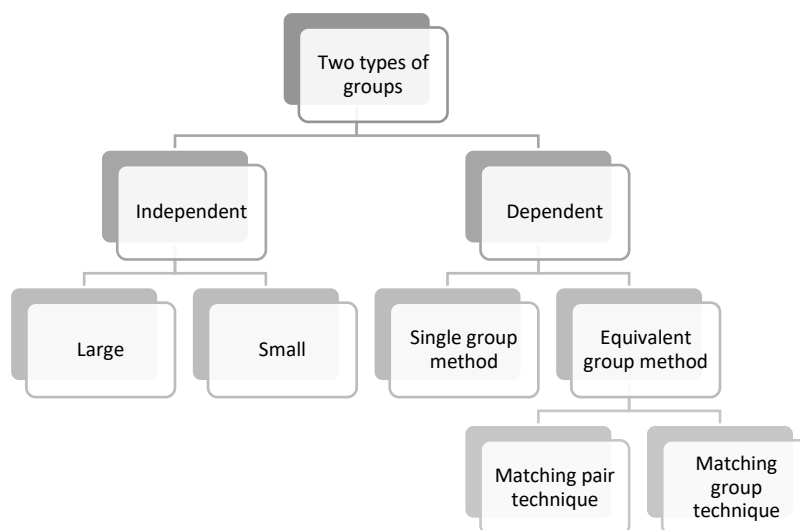
Parametric tests: Parametric tests are those that make assumptions about the parameters of the population distribution. They assume underlying statistical distribution (following normal probability curve distribution) in the data. Many validity criteria must be met for the parametric test result to be accurate.

Types of parametric test:

a) t-test: t-test is used to check whether the means of the two groups vary or not.

Formula for calculating t-test: $\text{Difference between the means of the two group} \div \text{standard error of difference between means}$

Types of t-test:

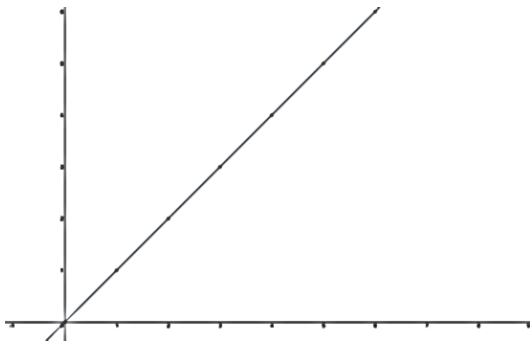


b) Anova: Analysis of variance is known as Anova. Anova is used to check whether there is any difference between the means of three or more independent (unrelated) groups. It is also used to check whether the groups are chosen from same population or not.

Anova is the ratio between mean sum of squares between variance (between means variability between different groups in a population) and mean sum of squares within variance (within variance refer to the total difference between one group)

c) linear regression: Linear regression is used to compare the numerical values to each other.

Correlation is shown between 2 set of values using linear regression. These sets should be present in pair. Shown below is a plot of the mathematical equation $y = x$. Sets of values such as (0,0), (1,1), (2,2), etc. can be plotted on line and this shows linear regression.



As the correlation is shown between 2 set of values using linear regression it see whether one value depends on other or not and whether changes in one create changes in other.

A straight line is almost never formed with sets of data point but linear regression can do that. This is usually done to get a direction. There is correlation between most of the data sets and this can be either positive correlation or can be negative correlation. When there is positive correlation, increase in one variable (dependent variable, on the y-axis) occur if there is an increase in other variable (independent variable, on the x-axis). Negative correlation occur when one variable decreases (dependent variable) due to increase in other variable (independent variable).

Non parametric test: Also referred to as distribution free test as they does not depend upon any kind of distribution. In this no assumption on is made about the distribution of data i.e. whether the data is normally distributed or not. They are applied when the conditions of validity related to parametric test are not met.

These are only used when no assumption exists regarding the distribution. there accuracy depends on how appropriately the researcher has used the test. Two types of non-parametric tests are Mann-Whitney-U test and Wilcoxon sign-rank test.

Week 6:

Comparing categorical data:

a) The chi-squared goodness-of-fit test: It is type of non-parametric test which is basically performed on categorical data. This test is done to see the difference between the value observed and the value expected(assumed or fitted model). Or we can say how well the observed values fits into the model.

b) The chi-squared test for independence: This test is performed to see the association between two nominal variable (categorical) so also referred to as chi square test for association. This is performed using contingency table.

c) Fisher's exact test: This test is used when chi square test becomes inaccurate. When analysis of contingency table is done then we use fishers test. Fishers test is used when numbers are small generally less than 5.

Sensitivity and specificity

Sensitivity is referred to as the probability of occurrence of a positive test when in actual the person is having a disease. Some gold standard is used where we know all of them are positive. For example if we run a new test on 100 patients and they all are suffering from disease. If 70 of them tests positive and 30 of them tests negative then we will say that 70% came out to be true positive and the test has 70% sensitivity while 30% came false negative and 30% are the chances that while testing individuals we will get false negative result.

Specificity is referred to as the probability of occurrence of a negative test when in actual the person is not having a disease. Some gold standard is used where we know all of them are negative. For example if we run a new test on 100 patients and they are not suffering from disease. If 70 of them tests negative and 30 of them tests positive then we will say that 70% came out to be true negative and the test has 70% specificity while 30% came false positive and 30% are the chances that while testing individuals we will get false positive result.

Predictive values: When a test yield a true result for true stats we call it as positive predicted value and when a test produces a false result for false stats we call it as false predicted value.