**ANEKANT EDUCATION SOCIETY**

TULJARAM CHATURCHAND COLLEGE OF ARTS, SCIENCE AND COMMERCE, BARAMATI.

**A PROJECT REPORT ON**

# "SEASONALITY OF TUBERCULOSIS IN BARAMATI"

SUBMITTED TO

## Department of statistics

**FOR**

**T.Y. B.Sc. (STATISTICS)**

BY


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UNDER THE GUIDENCE OF

Dr. Patil V. V.

2021-2022


# TULJARAM CHATURCHAND COLLEGE, BARAMATI

## CERTIFICATE

This is to certify that the project report entitled **"SEASONALITY OF TUBERCULOSIS IN BARAMATI" Is** being submitted by Jadhav V.P., Awate A.P., Thite O.A., Gholap R.K., Zambare S.K., as a partial fulfilment for the award of the degree of the Bachelor of Science(B.Sc.).This is a record of Bonafede work carried out by them under my supervision and guidance.

Dr. Patil.V.V — PROJECT GUIDE

EXAMINER

Dr. Jagtap A.S. — HEAD

DEPERTMENT OF STATISTICS

PLACE: BARAMATI

DATE:

# ACKNOWLEDGEMENT

We take this opportunity to express our sense of gratitude to Dr. Patil V.V For her inspiring guidance, immense motivation, constant encouragement & a critical approach at every stage, till project work complete successfully.

We are thankful to Dr. A.S. Jagtap (Head. Of Department Of Statistics & vice principal of T.C.College), For providing all necessary facilities & good co-operation.

We are also thankful all staff member of the Dept. of statistics for their valuable discussion and guidance for completion of our project.

I express my sincere thanks to my classmates for their help in the process of this work. Last but not least, we would like to thanks non-teaching staff of the department of the statistics.

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# ABSTRACT

The main purpose of this project is to make people aware of the disease tuberculosis. The WHO recommends that the best way to prevent Tuberculosis is to spread the word about Tuberculosis and its remedies.

We study this topic to evaluate the knowledge of the people of Baramati city about Tuberculosis and preventive measures and also to create awareness among the people of Baramati about the determinants of infection. We also check the trend of infection of Tuberculosis in this study.

We use testing of hypothesis technique to test proportion of infections in male female, rural urban, etc. We have used the time series model for awareness with various properties Based on that, we are going to check the tuberculosis seasonality in Baramati city.

We observe that Male patient is greater than female patient, proportion of Relaps (same patient is infected second time) of Tuberculosis in Female patient and Male patient are same. The new patient of Tuberculosis identified by spit test is less than new patient of Tuberculosis identified by lung test.

# MOTIVATION

The project aims to raise awareness about Tuberculosis and spread social awareness. With the help of a small project we want to focus on this issue.

We observe that the infection of Tuberculosis in certain gender and specific ward in the city of Baramati. Therefore, we decided to identify the real causes responsible for influencing Tuberculosis. So all the members of our project group decided to do a project on social awareness about Tuberculosis.

Tuberculosis is a serious problem right now. There is a lack of awareness in the society about this disease. Some people have no idea about this disease. They are not fully aware of this so the patient reaches critical stage. This project will help to increase in awareness of Tuberculosis.

# INTRODUCTION

Tuberculosis is a disease caused by a bacterium called Mycobacterium Tuberculosis. It is mainly caused by lung disease. It can also affect other parts of the body e.g. Myocardial infarction, circulatory system, skin, bones etc.

According to the World Health Organization (WHO)Trusted Source, 1.5 million people died from the disease in 2020. Tuberculosis is also the 13th leading cause of death globally. Currently, it's the second main infectious cause of death, after COVID-2019

## ♦ Natural history of Tuberculosis:-

Every time a Tuberculosis patient coughs or sneezes, the Tuberculosis germs spread in the environment. They enter the body of a healthy person through breathing. Not all people will get tuberculosis once they are admitted. People who have low immunity later show symptoms of Tuberculosis. One Tuberculosis patient can spread the disease to 10 to 15 people in a year. There are many factors that can cause illness, e.g. People living in densely populated areas, closed rooms, malnutrition, lack of immunity, some other major diseases (AIDS) etc. The only way to stop the spread is to get Tuberculosis patients treated as soon as possible.

## ♦ Pathogenesis :-

When the Tuberculosis bacterium enters the lungs through inhalation, their numbers increase. After a few days, the person begins to show symptoms of Tuberculosis. This is what we call pulmonary tuberculosis. Transmission of these bacteria from the lungs to some patients in other parts of the body e.g. Brain, kidneys, bones, skin etc. The disease can spread from place to place. Tuberculosis is a serious form of pneumonia in children and HIV-infected patients and is called miliary tuberculosis.

## ♦ Bacteria:-

There are two types of tuberculosis bacteria. One type of bacterium causes disease in humans and another in animals. There are four types of bacteria in humans.

1). Photochromogen

2). Schnotochromogen

3) Nanophotochromogen

4) Rapid Growers

## ♦ Bacterial Source:-

The source of the bacterium is a contagious Tuberculosis patient who has not received full treatment. Such a patient releases the bacteria into the environment through his saliva. Sometimes the disease can be transmitted by boiling the milk of an animal with Tuberculosis, but the incidence is very low.

According to the World Health Organization (WHO)Trusted Source, 1.5 million people died from the disease in 2020. Tuberculosis is also the 13th leading cause of death globally. Currently, it's the second main infectious cause of death, after COVID-19

# OBJECTIVE

1) Study the relationship of Tuberculosis affection and effect of various to factors like

    - New Patient
    - Relaps Patient
    - Spit Patient
    - Lung Patient

2) Checking for Tuberculosis Seasonality.
3) Does Baramati have adequate facilities for Tuberculosis?
4) Whether people have severe levels of Tuberculosis?

# METHODOLOGY

We have used secondary data for our project. We have taken this data from Women's Hospital Baramati in which we have collected data in new patient, relapse patient, sputum contaminated patient, lung patient type we have got total data of 36 months from Jan 2019 to Dec 2021. We got this data gender wise.

We have done a graphical representation of the data to summarize data.

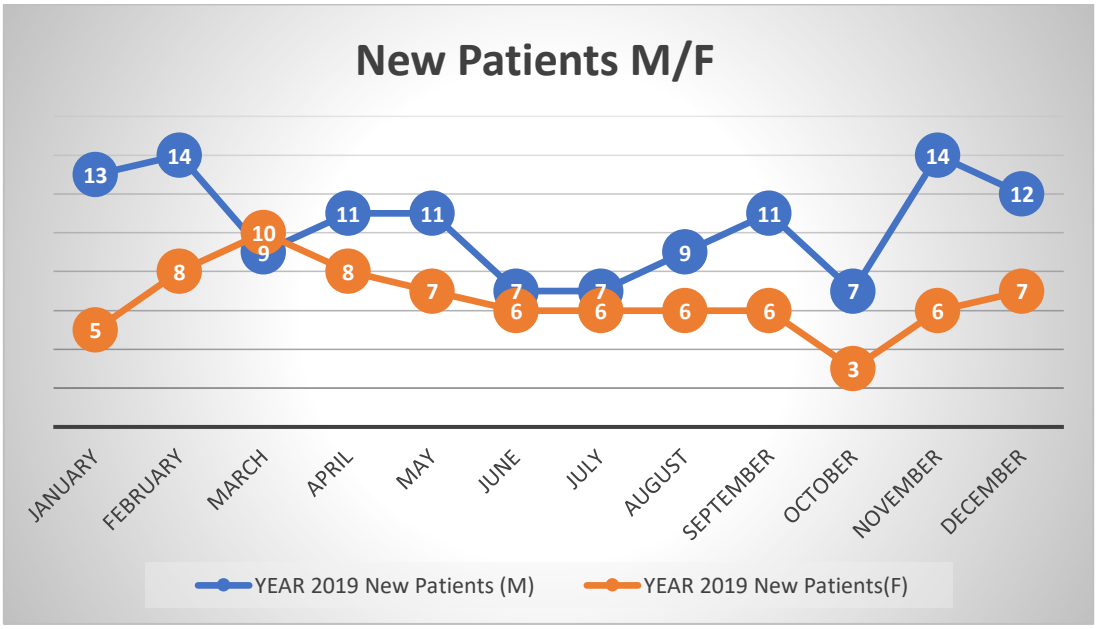
In this study, we are interested in analyse the infection of Tuberculosis, relapse of Tuberculosis, and detection of Tuberculosis is same in male and female. We done this using Z test.

After that we used the time series analysis since this data is chronological. We observe that, there is seasonality using graph. So, we are interested is identify seasonality and removed it from data. We also estimate number of patients infected by Tuberculosis in Baramati region for next year.

# EXPLORATORY DATA ANAYLSIS

♦ **NEW PATIENTS 2019 MALE/FEMALE:**

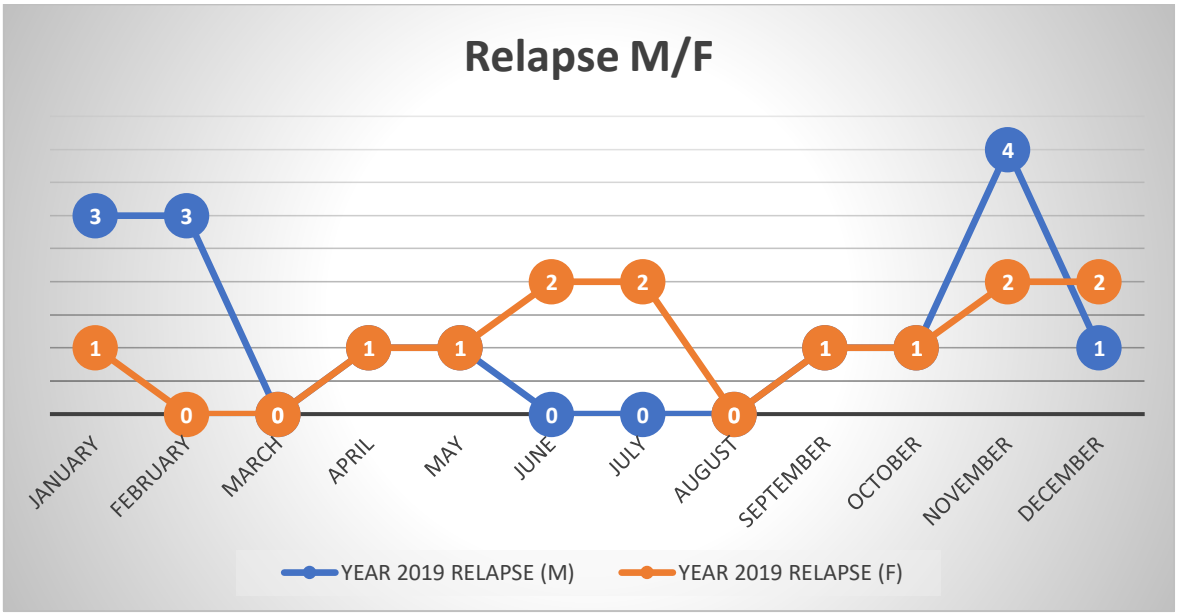
| | YEAR 2019 | |
|---|---|---|
| **Months** | **New Patients (M)** | **New Patients(F)** |
| JANUARY | 13 | 5 |
| FEBRUARY | 14 | 8 |
| MARCH | 9 | 10 |
| APRIL | 11 | 8 |
| MAY | 11 | 7 |
| JUNE | 7 | 6 |
| JULY | 7 | 6 |
| AUGUST | 9 | 6 |
| SEPTEMBER | 11 | 6 |
| OCTOBER | 7 | 3 |
| NOVEMBER | 14 | 6 |
| DECEMBER | 12 | 7 |




**Conclusion:-** Above graph concludes that the new patients of Tuberculosis male patients is greater than female patients in 2019.

♦ **RELAPS PATIENTS 2019 MALE / FEMALE:**

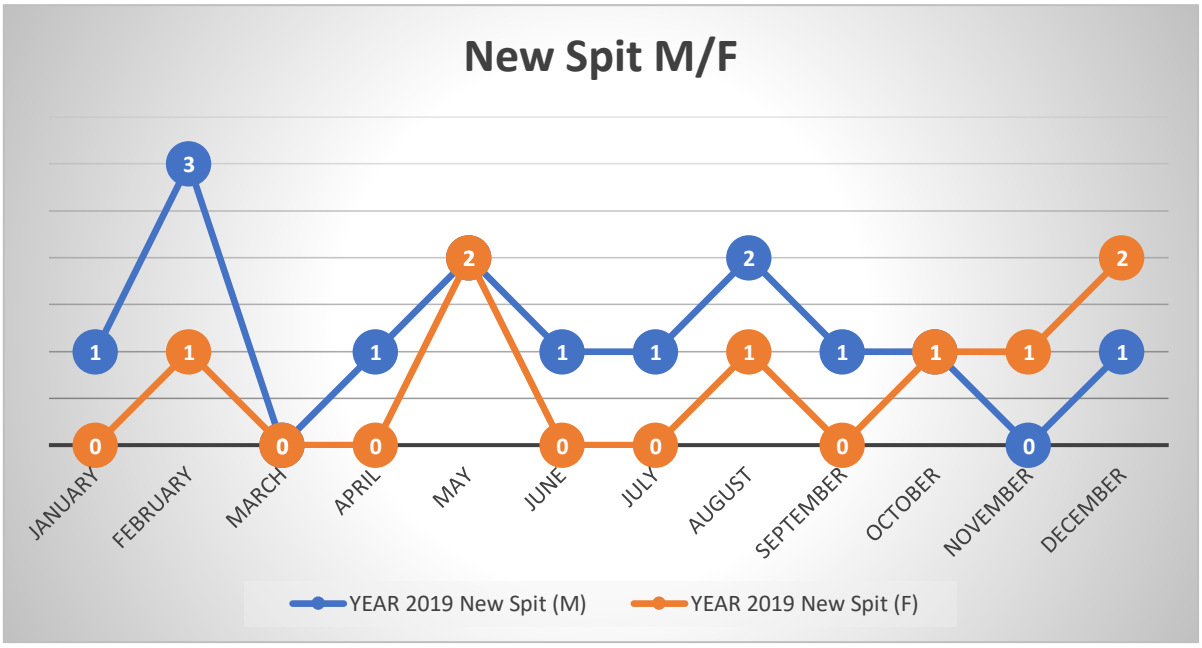
| | YEAR 2019 | |
|---|---|---|
| **Months** | **RELAPSE (M)** | **RELAPSE (F)** |
| JANUARY | 3 | 1 |
| FEBRUARY | 3 | 0 |
| MARCH | 0 | 0 |
| APRIL | 1 | 1 |
| MAY | 1 | 1 |
| JUNE | 0 | 2 |
| JULY | 0 | 2 |
| AUGUST | 0 | 0 |
| SEPTEMBER | 1 | 1 |
| OCTOBER | 1 | 1 |
| NOVEMBER | 4 | 2 |
| DECEMBER | 1 | 2 |




**Conclusion:-** The Relapse ( same patient is infected second time) of Tuberculosis that the male patient is affecting than female patient in 2019.

♦ **NEW SPIT 2019 MALE / FEMALE :**

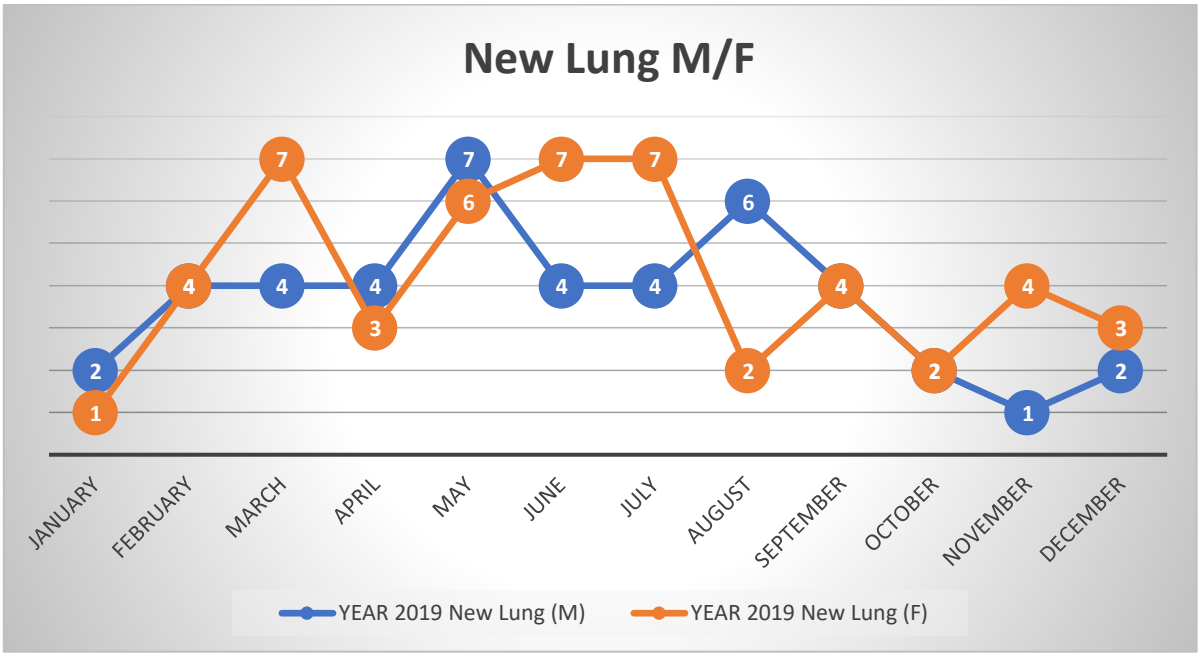
| | YEAR 2019 | |
|---|---|---|
| **Months** | **New Spit (M)** | **New Spit (F)** |
| JANUARY | 1 | 0 |
| FEBRUARY | 3 | 1 |
| MARCH | 0 | 0 |
| APRIL | 1 | 0 |
| MAY | 2 | 2 |
| JUNE | 1 | 0 |
| JULY | 1 | 0 |
| AUGUST | 2 | 1 |
| SEPTEMBER | 1 | 0 |
| OCTOBER | 1 | 1 |
| NOVEMBER | 0 | 1 |
| DECEMBER | 1 | 2 |




**Conclusion:-** In 2019,The new spit patient of male is greater than new spit patient of female of Tuberculosis.

♦ **NEW LUNG 2019 MALE / FEMALE :**

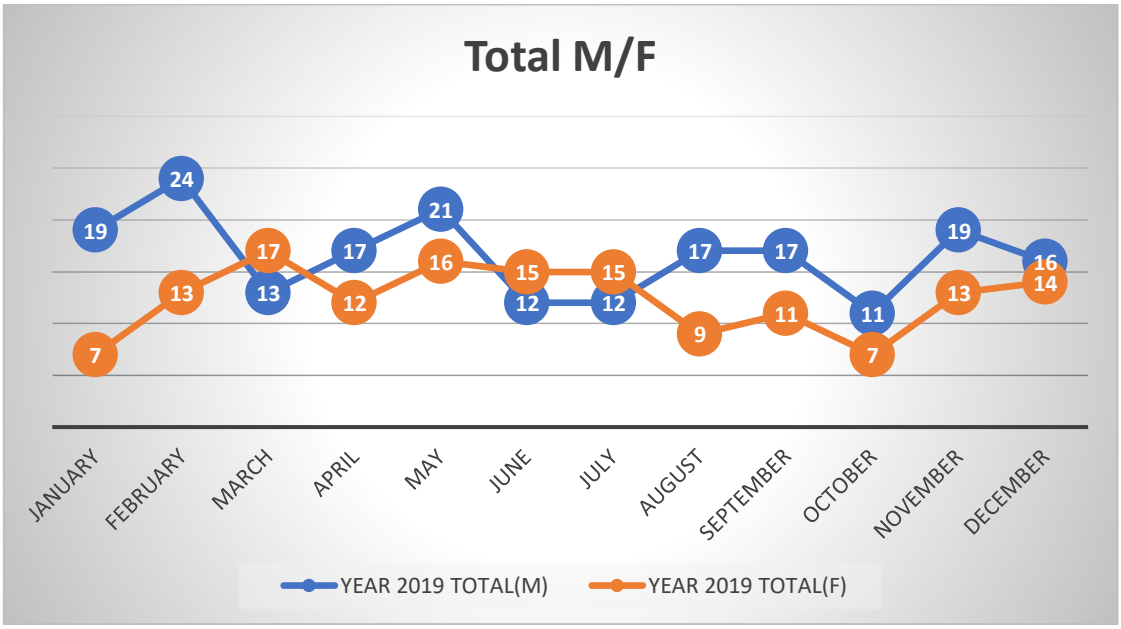
| | YEAR 2019 | |
|---|---|---|
| **Months** | **New Lung (M)** | **New Lung (F)** |
| JANUARY | 2 | 1 |
| FEBRUARY | 4 | 4 |
| MARCH | 4 | 7 |
| APRIL | 4 | 3 |
| MAY | 7 | 6 |
| JUNE | 4 | 7 |
| JULY | 4 | 7 |
| AUGUST | 6 | 2 |
| SEPTEMBER | 4 | 4 |
| OCTOBER | 2 | 2 |
| NOVEMBER | 1 | 4 |
| DECEMBER | 2 | 3 |




**Conclusion:-** Above graph concludes that in 2019, new lung patients of Tuberculosis of female patient is greater than male patient .

♦ **TOTAL MALE / FEMALE 2019**

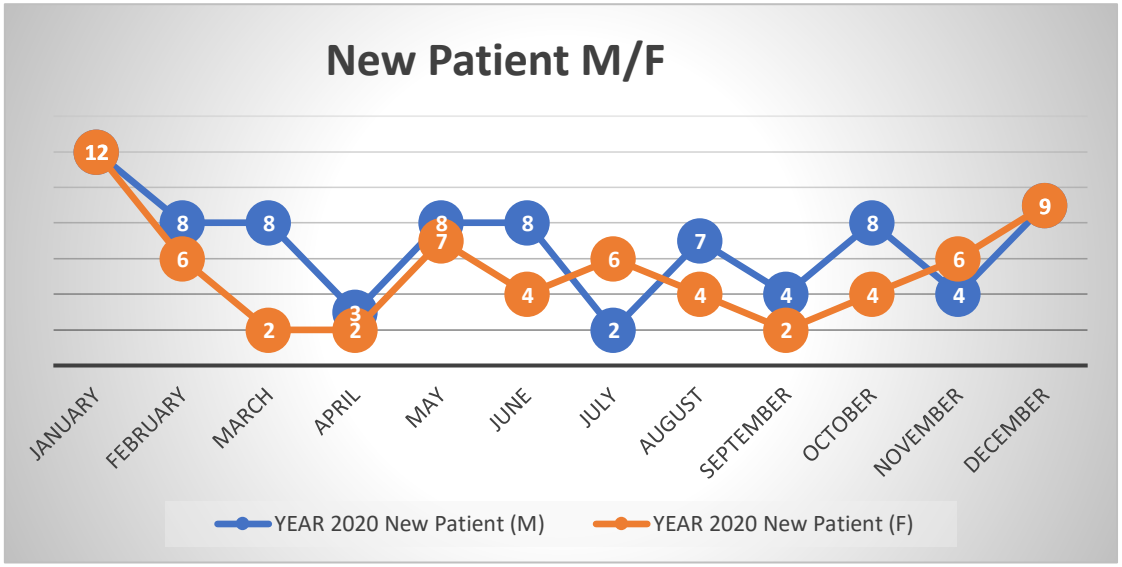
| | YEAR 2019 | |
|---|---|---|
| **Months** | **TOTAL(M)** | **TOTAL(F)** |
| JANUARY | 19 | 7 |
| FEBRUARY | 24 | 13 |
| MARCH | 13 | 17 |
| APRIL | 17 | 12 |
| MAY | 21 | 16 |
| JUNE | 12 | 15 |
| JULY | 12 | 15 |
| AUGUST | 17 | 9 |
| SEPTEMBER | 17 | 11 |
| OCTOBER | 11 | 7 |
| NOVEMBER | 19 | 13 |
| DECEMBER | 16 | 14 |




**Conclusion**:- Overalls patient of Tuberculosis in 2019 ,Male patient is more than female patient.

♦ **NEW PATIENT 2020 MALE / FEMALE**

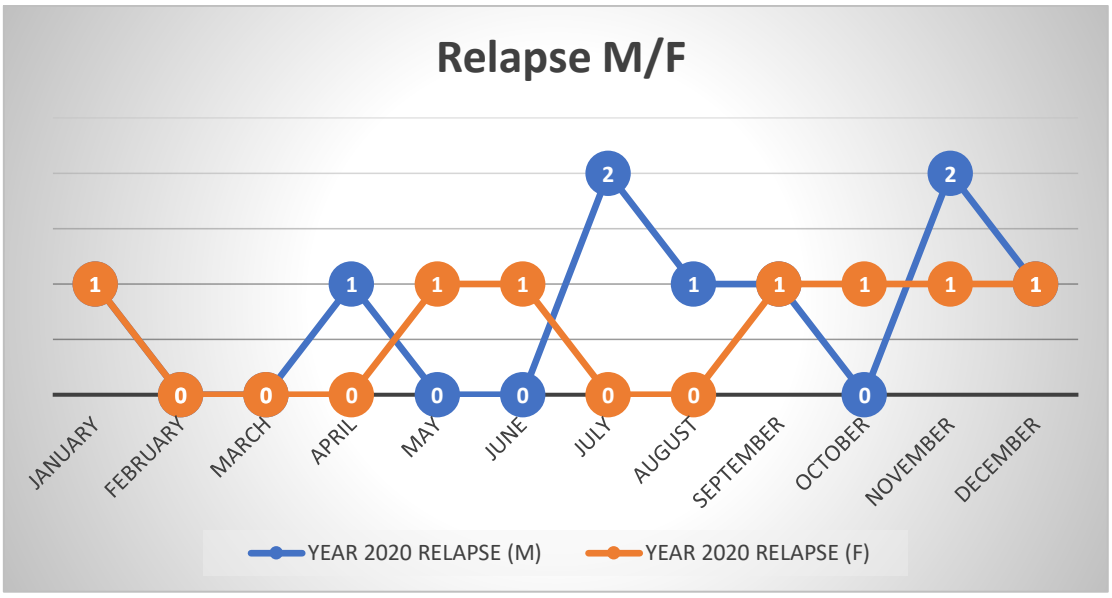
| | YEAR 2020 | |
|---|---|---|
| **Months** | **New Patient (M)** | **New Patient (F)** |
| JANUARY | 12 | 12 |
| FEBRUARY | 8 | 6 |
| MARCH | 8 | 2 |
| APRIL | 3 | 2 |
| MAY | 8 | 7 |
| JUNE | 8 | 4 |
| JULY | 2 | 6 |
| AUGUST | 7 | 4 |
| SEPTEMBER | 4 | 2 |
| OCTOBER | 8 | 4 |
| NOVEMBER | 4 | 6 |
| DECEMBER | 9 | 9 |




**Conclusion:-** Above graph concludes that the new patients of Tuberculosis male patients is greater than female patients in 2020.

♦ **RELAPS 2020 MALE / FEMALE**

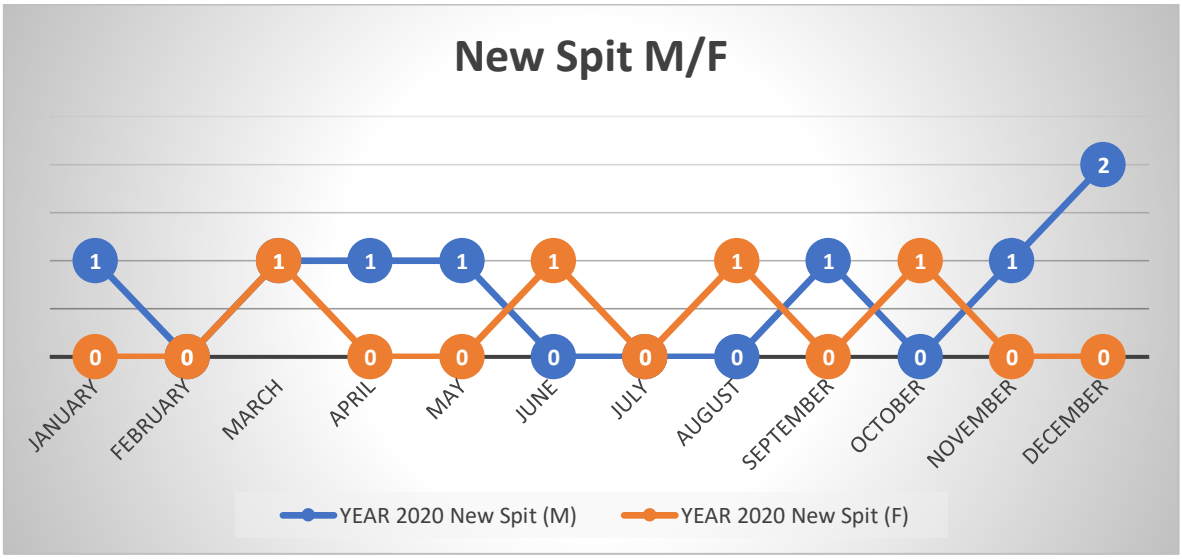
| | YEAR 2020 | |
|---|---|---|
| **Months** | **RELAPSE (M)** | **RELAPSE (F)** |
| JANUARY | 1 | 1 |
| FEBRUARY | 0 | 0 |
| MARCH | 0 | 0 |
| APRIL | 1 | 0 |
| MAY | 0 | 1 |
| JUNE | 0 | 1 |
| JULY | 2 | 0 |
| AUGUST | 1 | 0 |
| SEPTEMBER | 1 | 1 |
| OCTOBER | 0 | 1 |
| NOVEMBER | 2 | 1 |
| DECEMBER | 1 | 1 |




**Conclusion:-** The Relapse ( same patient is infected second time) of Tuberculosis that the male patient is affecting than female patient in 2020.

♦ **NEW SPIT 2020 MALE / FEMALE**

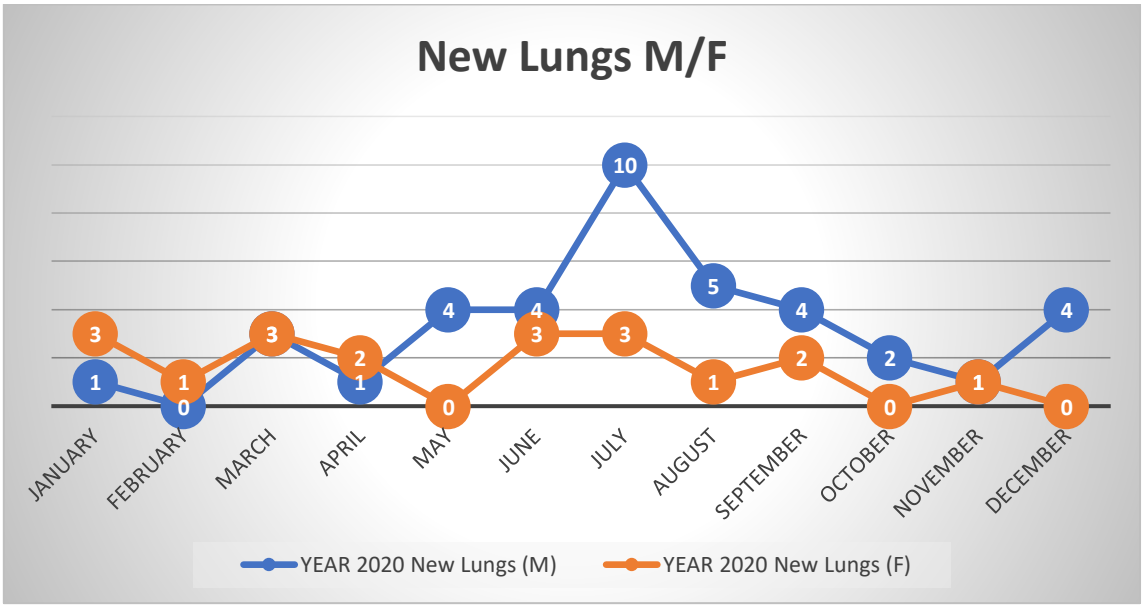
| | YEAR 2020 | |
|---|---|---|
| **Months** | **New Spit (M)** | **New Spit (F)** |
| JANUARY | 1 | 0 |
| FEBRUARY | 0 | 0 |
| MARCH | 1 | 1 |
| APRIL | 1 | 0 |
| MAY | 1 | 0 |
| JUNE | 0 | 1 |
| JULY | 0 | 0 |
| AUGUST | 0 | 1 |
| SEPTEMBER | 1 | 0 |
| OCTOBER | 0 | 1 |
| NOVEMBER | 1 | 0 |
| DECEMBER | 2 | 0 |




**Conclusion:-** In 2020,The male patient is greater than female patient in new spit of Tuberculosis.

♦ **NEW LUNG 2020 MALE / FEMALE**

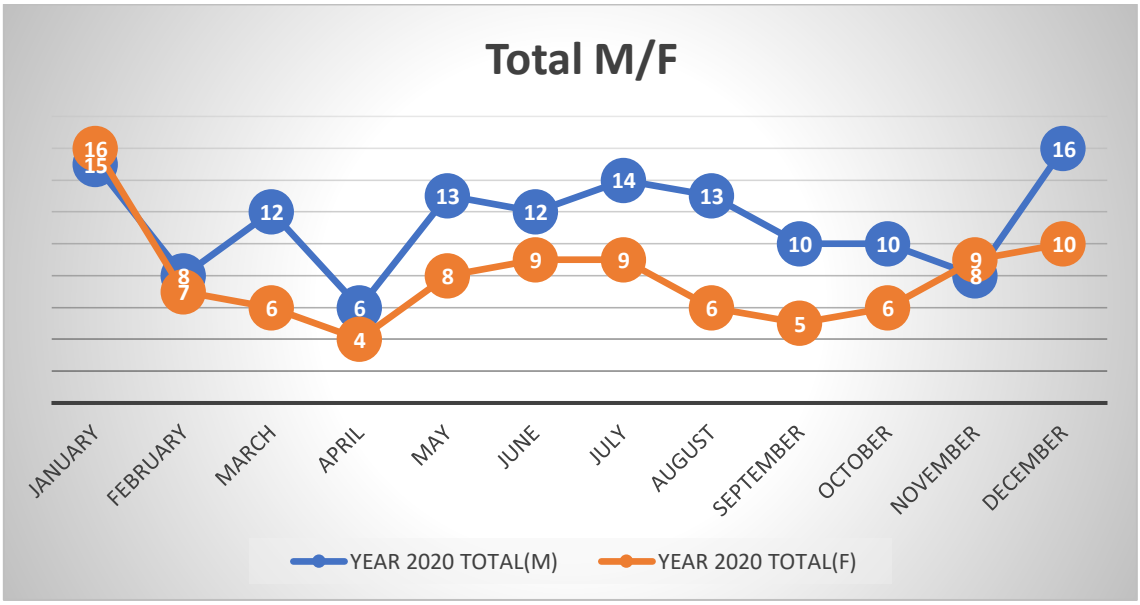
| | YEAR 2020 | |
|---|---|---|
| **Months** | **New Lungs (M)** | **New Lungs (F)** |
| JANUARY | 1 | 3 |
| FEBRUARY | 0 | 1 |
| MARCH | 3 | 3 |
| APRIL | 1 | 2 |
| MAY | 4 | 0 |
| JUNE | 4 | 3 |
| JULY | 10 | 3 |
| AUGUST | 5 | 1 |
| SEPTEMBER | 4 | 2 |
| OCTOBER | 2 | 0 |
| NOVEMBER | 1 | 1 |
| DECEMBER | 4 | 0 |




**Conclusion:-** Above graph concludes that in 2020, new lung patients of Tuberculosis of male patient is greater than female patient .

♦ **TOTAL 2020 MALE / FEMALE**

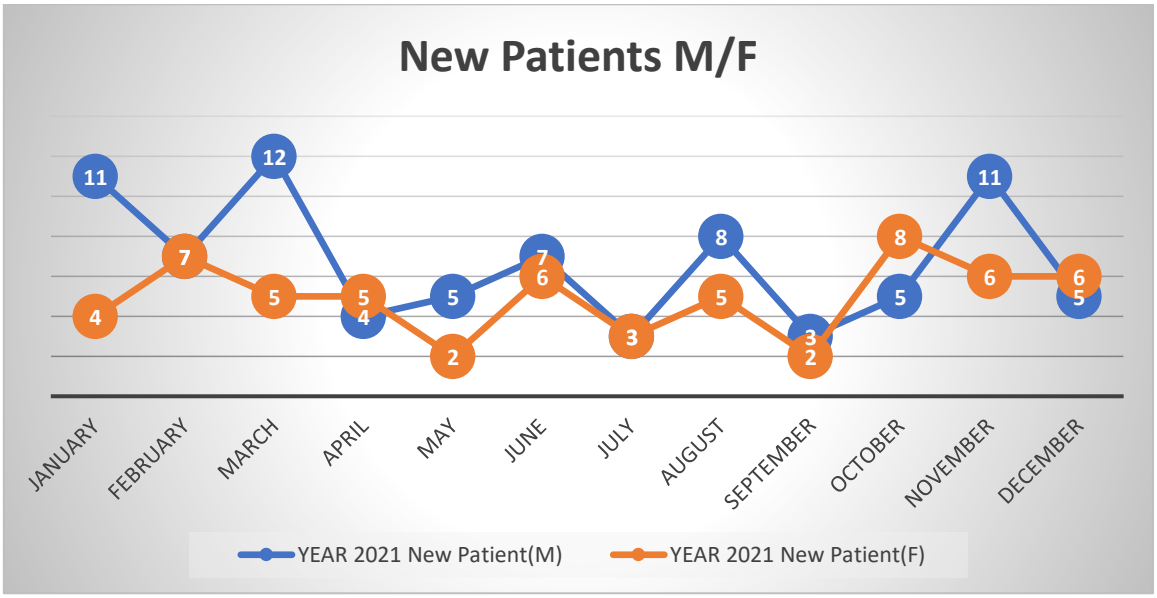
| | YEAR 2020 | |
|---|---|---|
| **Months** | **TOTAL(M)** | **TOTAL(F)** |
| JANUARY | 15 | 16 |
| FEBRUARY | 8 | 7 |
| MARCH | 12 | 6 |
| APRIL | 6 | 4 |
| MAY | 13 | 8 |
| JUNE | 12 | 9 |
| JULY | 14 | 9 |
| AUGUST | 13 | 6 |
| SEPTEMBER | 10 | 5 |
| OCTOBER | 10 | 6 |
| NOVEMBER | 8 | 9 |
| DECEMBER | 16 | 10 |




Conclusion:- Overalls patient of Tuberculosis in 2020 ,Male patient is more than female patient.

♦ **NEW PATIENT 2021 MALE / FEMALE**

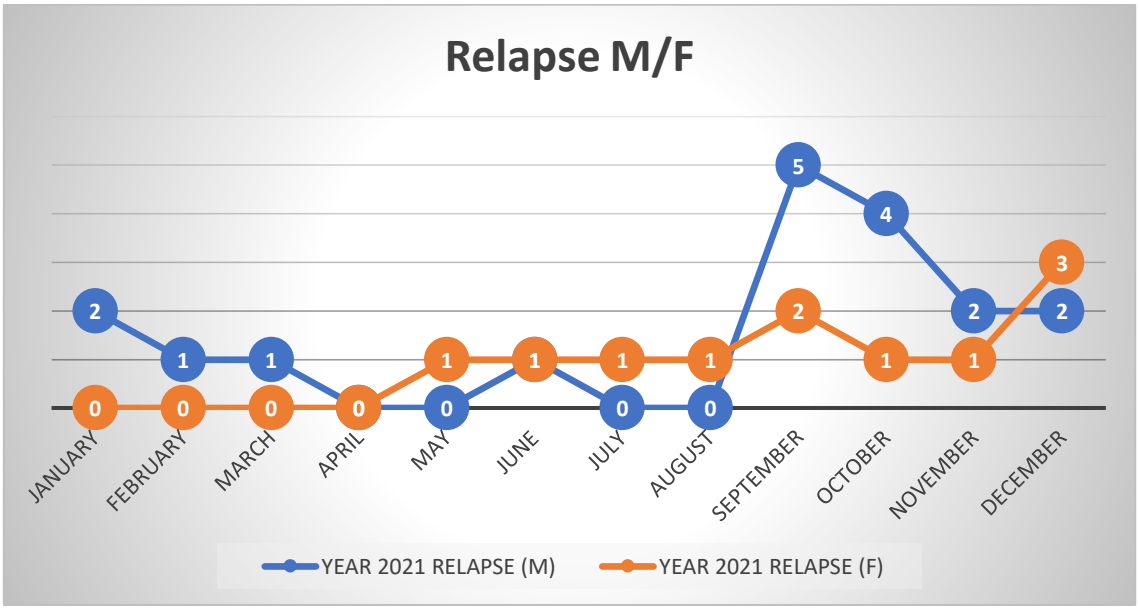
| | YEAR 2021 | |
|---|---|---|
| **Months** | **New Patient(M)** | **New Patient(F)** |
| JANUARY | 11 | 4 |
| FEBRUARY | 7 | 7 |
| MARCH | 12 | 5 |
| APRIL | 4 | 5 |
| MAY | 5 | 2 |
| JUNE | 7 | 6 |
| JULY | 3 | 3 |
| AUGUST | 8 | 5 |
| SEPTEMBER | 3 | 2 |
| OCTOBER | 5 | 8 |
| NOVEMBER | 11 | 6 |
| DECEMBER | 5 | 6 |




**Conclusion:-** Above graph concludes that the new patients of Tuberculosis male patients is greater than female patients in 2021.

♦ **REALPSE 2021 MALE / FEMALE**

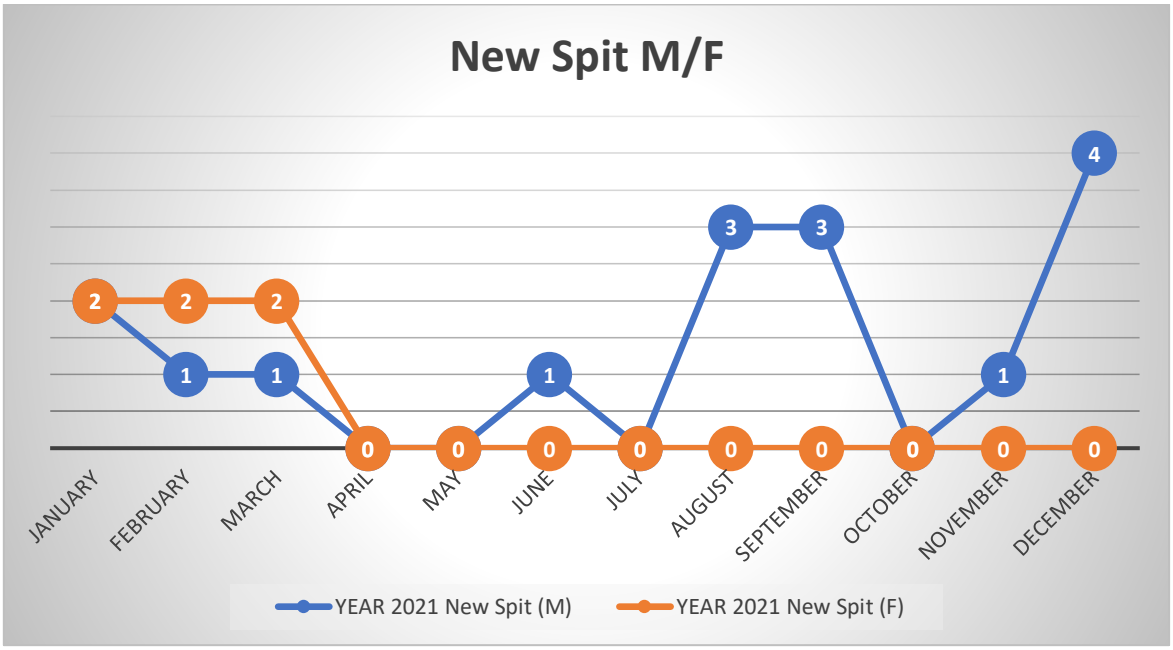
| | YEAR 2021 | |
|---|---|---|
| **Months** | **RELAPSE (M)** | **RELAPSE (F)** |
| JANUARY | 2 | 0 |
| FEBRUARY | 1 | 0 |
| MARCH | 1 | 0 |
| APRIL | 0 | 0 |
| MAY | 0 | 1 |
| JUNE | 1 | 1 |
| JULY | 0 | 1 |
| AUGUST | 0 | 1 |
| SEPTEMBER | 5 | 2 |
| OCTOBER | 4 | 1 |
| NOVEMBER | 2 | 1 |
| DECEMBER | 2 | 3 |




**Conclusion:-** The Relapse ( same patient is infected second time) of Tuberculosis that the male patient is affecting than female patient in 2021.

♦ **NEW SPIT 2021 MALE / FEMALE**

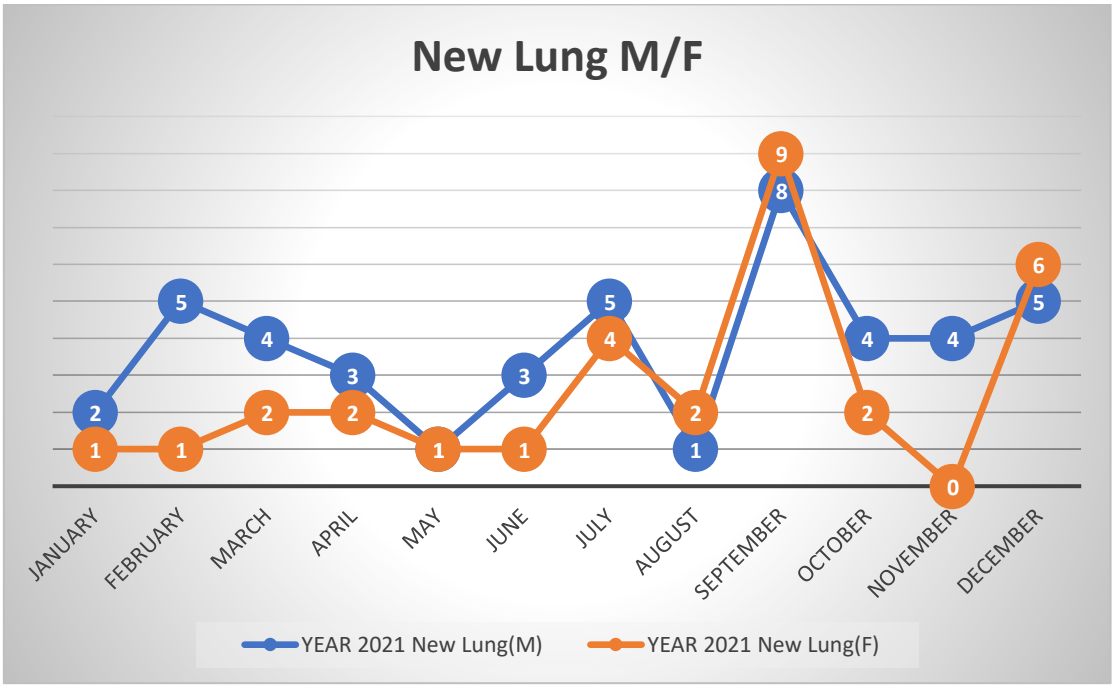
| | YEAR 2021 | |
|---|---|---|
| **Months** | **New Spit (M)** | **New Spit (F)** |
| JANUARY | 2 | 2 |
| FEBRUARY | 1 | 2 |
| MARCH | 1 | 2 |
| APRIL | 0 | 0 |
| MAY | 0 | 0 |
| JUNE | 1 | 0 |
| JULY | 0 | 0 |
| AUGUST | 3 | 0 |
| SEPTEMBER | 3 | 0 |
| OCTOBER | 0 | 0 |
| NOVEMBER | 1 | 0 |
| DECEMBER | 4 | 0 |




**Conclusion:-** In 2021,The male patient is greater than female patient in new spit of Tuberculosis.

♦ **NEW LUNG 2021 MALE / FEMALE**

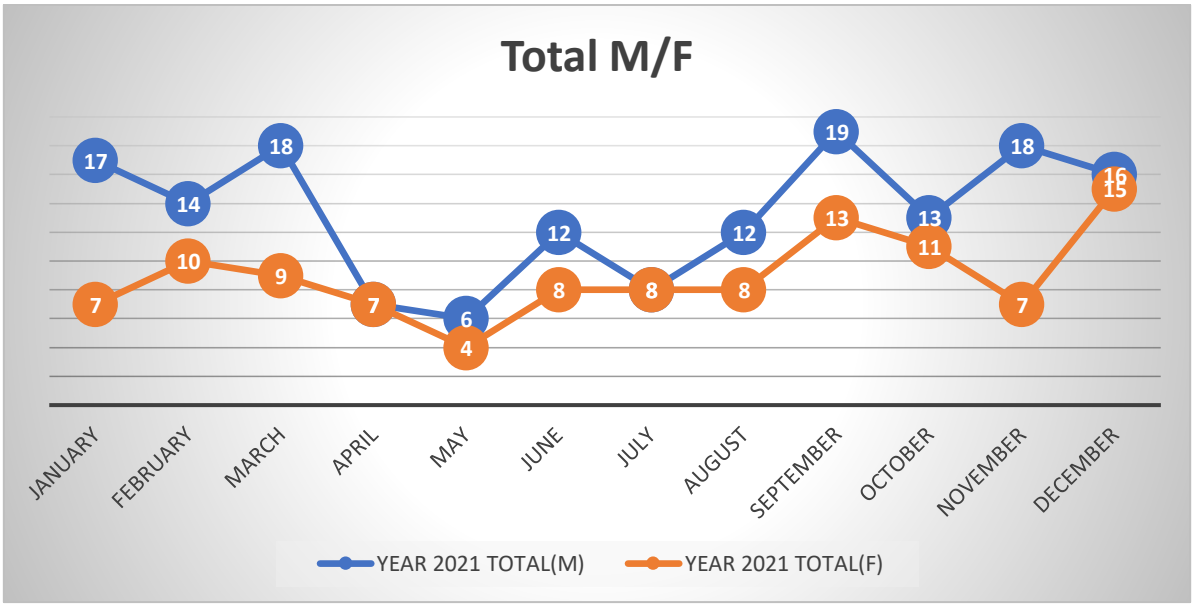
| | YEAR 2021 | |
|---|---|---|
| **Months** | **New Lung(M)** | **New Lung(F)** |
| JANUARY | 2 | 1 |
| FEBRUARY | 5 | 1 |
| MARCH | 4 | 2 |
| APRIL | 3 | 2 |
| MAY | 1 | 1 |
| JUNE | 3 | 1 |
| JULY | 5 | 4 |
| AUGUST | 1 | 2 |
| SEPTEMBER | 8 | 9 |
| OCTOBER | 4 | 2 |
| NOVEMBER | 4 | 0 |
| DECEMBER | 5 | 6 |




**Conclusion:-** Above graph concludes that in 2021, new lung patients of Tuberculosis of female patient is greater than male patient .

♦ **TOTAL 2021 MALE / FEMALE**

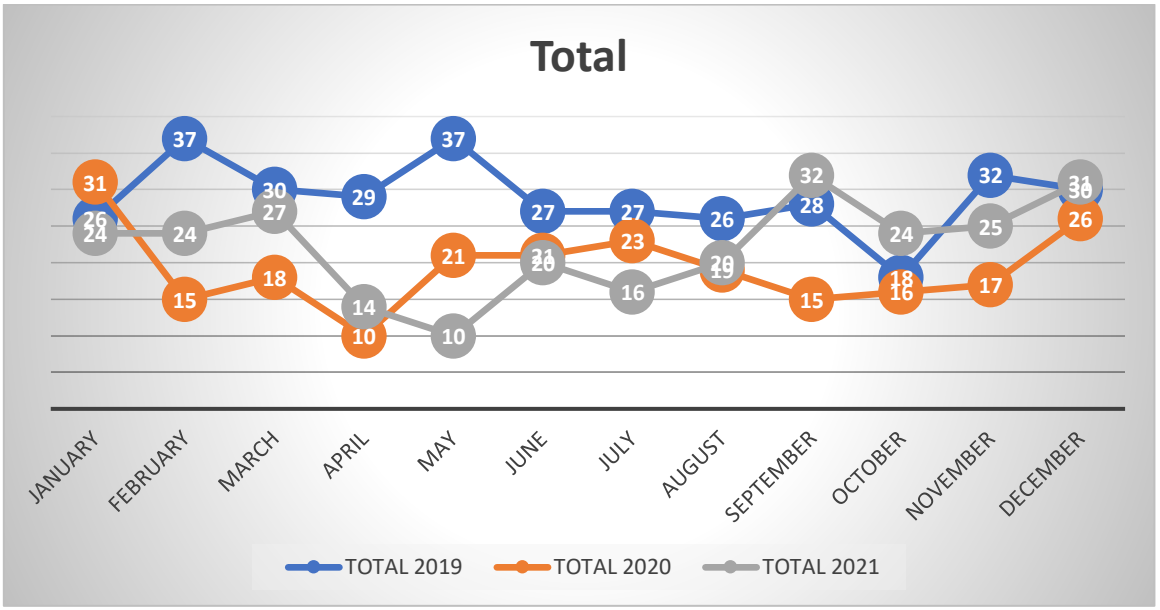
| | YEAR 2021 | |
|---|---|---|
| **Months** | **TOTAL(M)** | **TOTAL(F)** |
| JANUARY | 17 | 7 |
| FEBRUARY | 14 | 10 |
| MARCH | 18 | 9 |
| APRIL | 7 | 7 |
| MAY | 6 | 4 |
| JUNE | 12 | 8 |
| JULY | 8 | 8 |
| AUGUST | 12 | 8 |
| SEPTEMBER | 19 | 13 |
| OCTOBER | 13 | 11 |
| NOVEMBER | 18 | 7 |
| DECEMBER | 16 | 15 |




**Conclusion**:- Overalls patient of Tuberculosis in 2021 ,Male patient is more than female patient.

**TOTAL 2019,2020,2021 :**

| | TOTAL | | |
|---|---|---|---|
| **Months** | **2019** | **2020** | **2021** |
| JANUARY | 26 | 31 | 24 |
| FEBRUARY | 37 | 15 | 24 |
| MARCH | 30 | 18 | 27 |
| APRIL | 29 | 10 | 14 |
| MAY | 37 | 21 | 10 |
| JUNE | 27 | 21 | 20 |
| JULY | 27 | 23 | 16 |
| AUGUST | 26 | 19 | 20 |
| SEPTEMBER | 28 | 15 | 32 |
| OCTOBER | 18 | 16 | 24 |
| NOVEMBER | 32 | 17 | 25 |
| DECEMBER | 30 | 26 | 31 |




**Conclusion**:- Overalls patient of Tuberculosis ,Male patient is affected female patient.

# STATISTICAL ANALYSIS

- **Test for new patient (Male /Female)**

x=Total of new patient (Male)

n=Total no of new patient (Male /Female)

x=287 , n=488

> prop.test(x,n)

1-sample proportions test with continuity correction

X-squared = 14.805, df = 1, p-value = 0.0001192

alternative hypothesis: true p is not equal to 0.5

95 percent confidence interval: (0.5428920 , 0.6319289)

sample estimates: p =0.5881148

**Reject H0 at 5% l.o.s**

**Conclusion:- Male patient of Tuberculosis is greater than Female patient**

**●One Sided test**

H0: p=0.5 V/S H1:P > 0.5

> prop.test(x,n,p=0.5,alter="g")

X-squared = 14.805, df = 1, p-value = 5.96e-05

alternative hypothesis: true p is greater than 0.5

**hare p-value is < 0.05**

**i.e We can reject H0,we accept H1**

**Conclusion: In new patient tuberculosis test, male patient in grater than female patient.**

- **Test for Relaps patient (Male/Female)**

X=Total of Relaps male patient

n=Total Relaps (male/female) patient

> x=42, n=73

> prop.test(x,n)

1-sample proportions test with continuity correction

X-squared = 1.3699, df = 1, p-value = 0.2418

alternative hypothesis: true p is not equal to 0.5

95 percent confidence interval: (0.4542755, 0.6884330)

sample estimates: p=0.5753425

**Accept H0 at 5% l.o.s**

**Conclusion:-Proportion of Relaps (**same patient is infected second time) **of Tuberculosis Female patient and relaps Male patient are same.**

**●Test for new spit (Male/Female)**

x=Total of new spit male patient

n=Total of new patient (male/female) patient

>x=38, n=56

> prop.test(x,n)

1-sample proportions test with continuity correction

X-squared = 6.4464, df = 1, p-value = 0.01112

alternative hypothesis: true p is not equal to 0.5

95 percent confidence interval:( 0.5390880, 0.7935168)

sample estimates: p=0.6785714

**Reject H0 at 5% l.o.s**

**Conclusion:-New spit test of Tuberculosis male patient is not equal to new spit female patient.**

**● One Sided test**

H0: P=0.5 V/S H1:P>0.5

> prop.test(x,n,p=0.5,alter="g")

X-squared = 6.4464, df = 1, p-value = 0.005559

alternative hypothesis: true p is greater than 0.5

**Here p-value is <0.05**

**i.e We can reject H0,we accept H1**

**Conclusion:-Using spit test Tuberculosis identification is more in male patient than female patient.**

**Test for new lung (Male/Female)**

x=Total new lung male patient

n=Total new lung (male/female) patient

> x=128, n=228

> prop.test(x,n)

1-sample proportions test with continuity correction

X-squared = 3.1974, df = 1, p-value = 0.07376

alternative hypothesis: true p is not equal to 0.5

95 percent confidence interval: (0.4943138, 0.6263897)

sample estimates: p =0.5614035

**Accept H0 at 5% l.o.s**

**Conclusion:-New lung male patient is same as new lung female patient**

**Test for total (Male/Female)**

x=Total male patient

n=Total (male/female) patient

> x=495, n=846

> prop.test(x,n)

1-sample proportions test with continuity correction

X-squared = 24.171, df = 1, p-value = 8.813e-07

alternative hypothesis: true p is not equal to 0.5

95 percent confidence interval:(0.5509986, 0.6184311)

sample estimates: p =0.5851064

**Reject H0 at 5% l.o.s**

**Conclusion:-Proportion of Male patient is not equal to female patient.**

**●One Sided test**

H0:p=0.5 V/S H1:P>0.5

> prop.test(x,n,p=0.5,alter="g")

X-squared = 24.171, df = 1, p-value = 4.407e-07

alternative hypothesis: true p is greater than 0.5

**Here p-value is <0.05**

**i.e We can reject H0, we accept H1**

**Conclusion:- Proportion of Male patient of Tuberculosis may be greater than female patient**.

## ●Test for patient identified using spit and lung test

x=Total new split patient

n=Total new patient

> x=56, n=284

> prop.test(x,n)

1-sample proportions test with continuity correction

X-squared = 102.96, df = 1, p-value < 2.2e-16

alternative hypothesis: true p is not equal to 0.5

95 percent confidence interval:(0.1534992, 0.2492539)

sample estimates: p= 0.1971831

**Reject H0 at 5% l.o.s**

**Conclusion: The new patient of Tuberculosis identified by spit test may not be equal to new patient of Tuberculosis identified by lung test**

### ●One Sided test

H0: P=0.5 V/S H1:P < 0.5

> prop.test(x,n,p=0.5,alter="l")

X-squared = 102.96, df = 1, p-value = 2.2e-16

alternative hypothesis: true p is less than 0.5

**Here p-value is < 0.05**

**i.e We can reject H0, we accept H1**

**Conclusion:- : The new patient of Tuberculosis identified by spit test is less than new patient of Tuberculosis identified by lung test**

## ♦ Computations of ratio to moving average:

| YEAR | MONTH | TOTAL(O.V) | 12 MONTH M.T | 2 POINT MOVING TOTAL | CENTRED 12 MONTHLY M.A | RATIO OF M.A |
|---|---|---|---|---|---|---|
| 2019 | JANUARY | 32 | | | | 0 |
| 2019 | FEBRUARY | 30 | | | | 0 |
| 2019 | MARCH | 26 | | | | 0 |
| 2019 | APRIL | 37 | | | | 0 |
| 2019 | MAY | 30 | | | | 0 |
| 2019 | JUNE | 29 | 347 | | | 0 |
| 2019 | JULY | 37 | 332 | 679 | 28.29166667 | 102.5036819 |
| 2019 | AUGUST | 27 | 328 | 660 | 27.5 | 134.5454545 |
| 2019 | SEPTEMBER | 27 | 333 | 661 | 27.54166667 | 98.0332829 |
| 2019 | OCTOBER | 26 | 311 | 644 | 26.83333333 | 100.621118 |
| 2019 | NOVEMBER | 28 | 299 | 610 | 25.41666667 | 102.295082 |
| 2019 | DECEMBER | 18 | 280 | 579 | 24.125 | 116.0621762 |
| 2020 | JANUARY | 17 | 264 | 544 | 22.66666667 | 79.41176471 |
| 2020 | FEBRUARY | 26 | 258 | 522 | 21.75 | 78.16091954 |
| 2020 | MARCH | 31 | 254 | 512 | 21.33333333 | 121.875 |
| 2020 | APRIL | 15 | 247 | 501 | 20.875 | 148.502994 |
| 2020 | MAY | 18 | 234 | 481 | 20.04166667 | 74.84407484 |
| 2020 | JUNE | 10 | 232 | 466 | 19.41666667 | 92.70386266 |
| 2020 | JULY | 21 | 240 | 472 | 19.66666667 | 50.84745763 |
| 2020 | AUGUST | 21 | 245 | 485 | 20.20833333 | 103.9175258 |
| 2020 | SEPTEMBER | 23 | 238 | 483 | 20.125 | 104.3478261 |
| 2020 | OCTOBER | 19 | 247 | 485 | 20.20833333 | 113.814433 |
| 2020 | NOVEMBER | 15 | 256 | 503 | 20.95833333 | 90.65606362 |
| 2020 | DECEMBER | 16 | 260 | 516 | 21.5 | 69.76744186 |
| 2021 | JANUARY | 25 | 249 | 509 | 21.20833333 | 75.44204322 |
| 2021 | FEBRUARY | 31 | 248 | 497 | 20.70833333 | 120.7243461 |
| 2021 | MARCH | 24 | 241 | 489 | 20.375 | 152.1472393 |
| 2021 | APRIL | 24 | 242 | 483 | 20.125 | 119.2546584 |
| 2021 | MAY | 27 | 259 | 501 | 20.875 | 114.9700599 |
| 2021 | JUNE | 14 | 267 | 526 | 21.91666667 | 123.1939163 |
| 2021 | JULY | 10 | 242 | 509 | 21.20833333 | 66.01178782 |
| 2021 | AUGUST | 20 | | | 0 | 0 |
| 2021 | SEPTEMBER | 16 | | | 0 | 0 |
| 2021 | OCTOBER | 20 | | | 0 | 0 |
| 2021 | NOVEMBER | 32 | | | 0 | 0 |
| 2021 | DECEMBER | 24 | | | 0 | 0 |

## ♦ Computations of seasonal indices:

**Conclusion:-** Preliminary seasonal indices (A.M.) is 1240.766617 and Adjusted seasonal indices is 1241.537381

Correction factor C is 1.0006212

| MONTHS | RATIO OF M.A FOR YEAR | | | PRELIMINARY SEASONAL INDICES | |
|---|---|---|---|---|---|
| MONTHS | 2019 | 2020 | 2021 | | |
| JANUARY | 0 | 79.41176471 | 75.44204322 | 77.42690396 | 77.47500156 |
| FEBRUARY | 0 | 78.16091954 | 120.7243461 | 99.44263281 | 99.50440657 |
| MARCH | 0 | 121.875 | 152.1472393 | 137.0111196 | 137.0962309 |
| APRIL | 0 | 148.502994 | 119.2546584 | 133.8788262 | 133.9619917 |
| MAY | 0 | 74.84407484 | 114.9700599 | 94.90706736 | 94.96602363 |
| JUNE | 0 | 92.70386266 | 123.1939163 | 107.9488895 | 108.0159474 |
| JULY | 102.5036819 | 50.84745763 | 66.01178782 | 73.12097578 | 73.16639853 |
| AUGUST | 134.5454545 | 103.9175258 | 0 | 119.2314902 | 119.3055568 |
| SEPTEMBER | 98.0332829 | 104.3478261 | 0 | 101.1905545 | 101.2534141 |
| OCTOBER | 100.621118 | 113.814433 | 0 | 107.2177755 | 107.2843792 |
| NOVEMBER | 102.295082 | 90.65606362 | 0 | 96.47557279 | 96.53550342 |
| DECEMBER | 116.0621762 | 69.76744186 | 0 | 92.91480901 | 92.97252769 |
| | | | | 1240.766617 | 1241.537381 |
| | | | | | |
| | | | | SUM OF A.M=1240.766617 | 1.0006212 |
| | | | | | |

## ♦ Seasonwise :

| YEAR | SEASONS | TOTAL(O.V) | 12 MONTH M.T | 2 POINT MOVING TOTAL | CENTRED 12 MONTHLY M.A | RATIO OF M.A |
|---|---|---|---|---|---|---|
| 2019 | Winter | 125 | - | - | - | 0 |
| 2019 | Summer | 123 | 347 | - | - | 0 |
| 2019 | Rainy | 99 | 311 | 658 | 109.6666667 | 90.27355623 |
| 2020 | Winter | 89 | 258 | 569 | 94.83333333 | 93.84885764 |
| 2020 | Summer | 70 | 232 | 490 | 81.66666667 | 85.71428571 |
| 2020 | Rainy | 73 | 247 | 479 | 79.83333333 | 91.44050104 |
| 2021 | Winter | 104 | 248 | 495 | 82.5 | 126.0606061 |
| 2021 | Summer | 71 | 267 | 515 | 85.83333333 | 82.7184466 |
| 2021 | Rainy | 92 | - | - | - | 0 |

| MONTHS | RATIO OF M.A FOR YEAR | | | PRELIMINARY SEASONAL INDICES | ADJUSTED SEASONAL INDICES |
|---|---|---|---|---|---|
| MONTHS | 2019 | 2020 | 2021 | | |
| 1 | 0 | 93.84885764 | 126.0606061 | 109.9547319 | 110.1416549 |
| 2 | 0 | 85.71428571 | 82.7184466 | 84.21636616 | 84.35953398 |
| 3 | 90.27355623 | 91.44050104 | 0 | 90.85702864 | 91.01148559 |
| | | | | 285.0281266 | 285.5126745 |
| | | | | | |
| | | | | 1.0017 | |

**Conclusion:-** Preliminary seasonal indices (A.M.) is 285.0281266 and Adjusted seasonal indices is 285.5126745

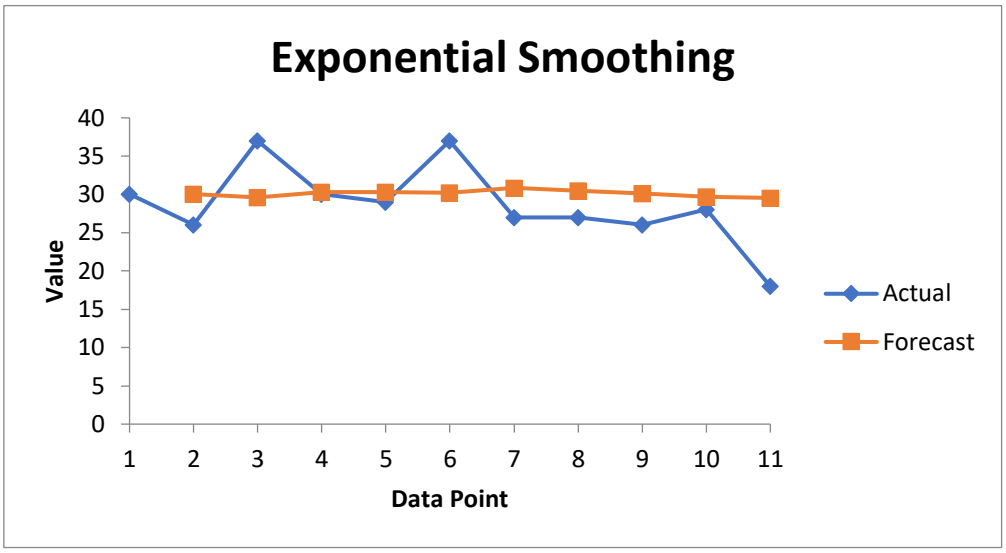
Correction factor C is 1.0017

## ♦ Exponential Smoothing

♦ 2019

| MONTH | TOTAL | α*(Yt-1) | (1-α)*Yt-1 | α*Yt-1+(1-α)*Yt-1 |
|---|---|---|---|---|
| JANUARY | 32 | | | |
| FEBRUARY | 30 | 3.2 | 28.8 | 32 |
| MARCH | 26 | 3 | 28.8 | 31.8 |
| APRIL | 37 | 2.6 | 28.62 | 31.22 |
| MAY | 30 | 3.7 | 28.098 | 31.798 |
| JUNE | 29 | 3 | 28.6182 | 31.6182 |
| JULY | 37 | 2.9 | 28.45638 | 31.35638 |
| AUGUST | 27 | 3.7 | 28.220742 | 31.920742 |
| SEPTEMBER | 27 | 2.7 | 28.728668 | 31.4286678 |
| OCTOBER | 26 | 2.7 | 28.285801 | 30.98580102 |
| NOVEMBER | 28 | 2.6 | 27.887221 | 30.48722092 |
| DECEMBER | 18 | 2.8 | 27.438499 | 30.23849883 |
| | | 1.8 | 27.214649 | 29.01464894 |

| Months | Total | | Forecast |
|---|---|---|---|
| JANUARY | 32 | | - |
| FEBRUARY | 30 | 32 | 30 |
| MARCH | 26 | 31.8 | 29.6 |
| APRIL | 37 | 31.22 | 30.34 |
| MAY | 30 | 31.798 | 30.306 |
| JUNE | 29 | 31.6182 | 30.1754 |
| JULY | 37 | 31.35638 | 30.85786 |
| AUGUST | 27 | 31.920742 | 30.472074 |
| SEPTEMBER | 27 | 31.4286678 | 30.124867 |
| OCTOBER | 26 | 30.985801 | 29.71238 |
| NOVEMBER | 28 | 30.4872209 | 29.541142 |
| DECEMBER | 18 | 30.2384988 | - |
| | | 29.0146489 | |

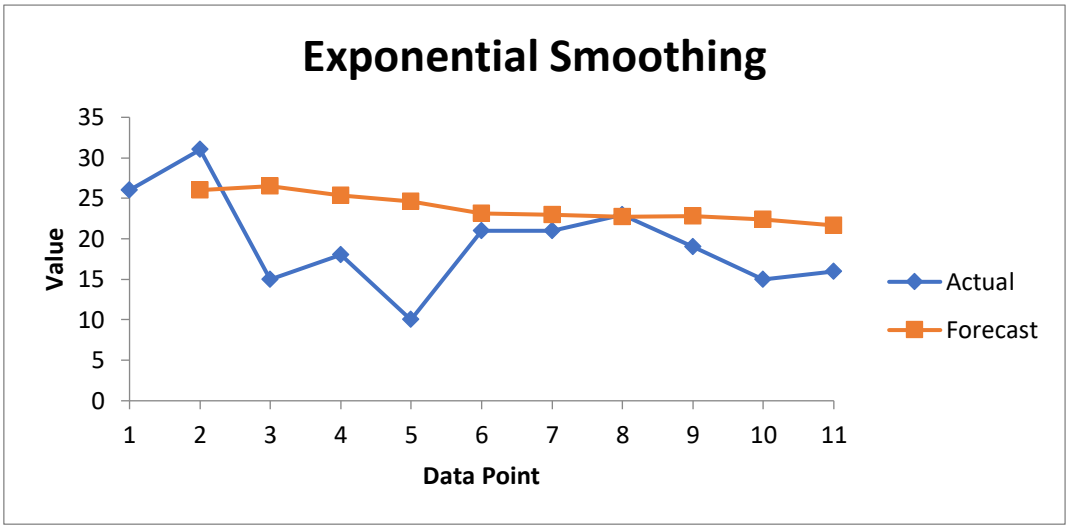



**Conclusion:-** Estimate the trend using 10% smoothing constant is 29.0146489

♦ 2020

| MONTH | TOTAL | α*Yt-1 | (1-α)*Yt-1 | α*Yt-1+(1-α)*Yt-1 |
|---|---|---|---|---|
| JANUARY | 17 | | | |
| FEBRUARY | 26 | 1.7 | 15.3 | 17 |
| MARCH | 31 | 2.6 | 15.3 | 17.9 |
| APRIL | 15 | 3.1 | 16.11 | 19.21 |
| MAY | 18 | 1.5 | 17.289 | 18.789 |
| JUNE | 10 | 1.8 | 16.9101 | 18.7101 |
| JULY | 21 | 1 | 16.83909 | 17.83909 |
| AUGUST | 21 | 2.1 | 16.055181 | 18.155181 |
| SEPTEMBER | 23 | 2.1 | 16.339663 | 18.4396629 |
| OCTOBER | 19 | 2.3 | 16.595697 | 18.89569661 |
| NOVEMBER | 15 | 1.9 | 17.006127 | 18.90612695 |
| DECEMBER | 16 | 1.5 | 17.015514 | 18.51551425 |

| Months | Total | | Forecast |
|---|---|---|---|
| JANUARY | 17 | | - |
| FEBRUARY | 26 | 17 | 26 |
| MARCH | 31 | 17.9 | 26.5 |
| APRIL | 15 | 19.21 | 25.35 |
| MAY | 18 | 18.789 | 24.615 |
| JUNE | 10 | 18.7101 | 23.1535 |
| JULY | 21 | 17.83909 | 22.93815 |
| AUGUST | 21 | 18.155181 | 22.744335 |
| SEPTEMBER | 23 | 18.4396629 | 22.769902 |
| OCTOBER | 19 | 18.8956966 | 22.392911 |
| NOVEMBER | 15 | 18.9061269 | 21.65362 |
| DECEMBER | 16 | 18.5155143 | - |

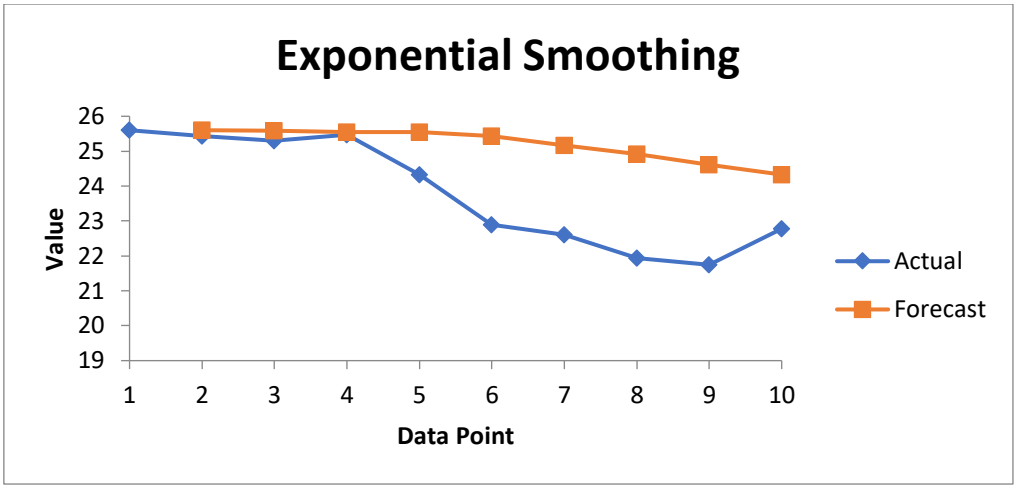



**Conclusion:-** Estimate the trend using 10% smoothing constant is 18.5155143

♦ 2021

| MONTH | TOTAL | α*Yt-1 | (1-α)*Yt-1 | α*Yt-1+(1-α)*Yt-1 |
|---|---|---|---|---|
| JANUARY | 25 | | | |
| FEBRUARY | 31 | 2.5 | 22.5 | 25 |
| MARCH | 24 | 3.1 | 22.5 | 25.6 |
| APRIL | 24 | 2.4 | 23.04 | 25.44 |
| MAY | 27 | 2.4 | 22.896 | 25.296 |
| JUNE | 14 | 2.7 | 22.7664 | 25.4664 |
| JULY | 10 | 1.4 | 22.91976 | 24.31976 |
| AUGUST | 20 | 1 | 21.887784 | 22.887784 |
| SEPTEMBER | 16 | 2 | 20.599006 | 22.5990056 |
| OCTOBER | 20 | 1.6 | 20.339105 | 21.93910504 |
| NOVEMBER | 32 | 2 | 19.745195 | 21.74519454 |
| DECEMBER | 24 | 3.2 | 19.570675 | 22.77067508 |

| Months | Total | | Forecast |
|---|---|---|---|
| JANUARY | 25 | | - |
| FEBRUARY | 31 | 25 | 25.6 |
| MARCH | 24 | 25.6 | 25.584 |
| APRIL | 24 | 25.44 | 25.5552 |
| MAY | 27 | 25.296 | 25.54632 |
| JUNE | 14 | 25.4664 | 25.423664 |
| JULY | 10 | 24.31976 | 25.170076 |
| AUGUST | 20 | 22.887784 | 24.912969 |
| SEPTEMBER | 16 | 22.5990056 | 24.615583 |
| OCTOBER | 20 | 21.939105 | 24.328544 |
| NOVEMBER | 32 | 21.7451945 | |
| DECEMBER | 24 | 22.7706751 | |




**Conclusion:-** Estimate the trend using 10% smoothing constant is 22.7706751

# CONCLUSION

1. We observe that infection of Tuberculosis is depend on Gender, **there is high risk for males to affecting Tuberculosis.**
2. Relapse of Tuberculosis( same patient is infected second time) is depended on infection of Tuberculosis, **there is high risk for male to** same patient is infected second time**.**
3. The new patient of Tuberculosis identified by spit test may not be equal to new patient of Tuberculosis identified by lung test
4. The new female patient of Tuberculosis identified by lung test may be greater than male patient**.**
5. Using spit test Tuberculosis identification is more in male patient than female patient.

# SCOPE AND LIMITATION

## Scope

- This project can be done for overall Maharashtra or India which represent whole population of our state or country.
- We may consider other factors which causes Tuberculosis.

## Limitation

- We got data from Baramati region only
- The number of females in the sample are less as compare to male.

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