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A Study of Mathematical Analysis of Hypertension Patients Using Statistics

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***Abstract*: Hypertension disease was analysed mathematically using t-test method in statistics of hypertension patients from Government Hospital, Mannargudi, Tiruvarur (Dt.), Tamil Nadu during the year 2020-2021.**

***Keywords*: Data analysis, Statistics.**

1. Introduction

The most important word in the term Statistical Quality Control is quality. Quality control is a powerful productivity technique for effective diagnosis of lack of quality or conformity to settled standards in any of the materials, process, machine or end products. The main purpose of statistical quality control (S.Q.C) is to devise statistical technique which would help us in separating the assignable.

- T-test definition
- Independent of t-test for two samples

A. T-test definition

A t-test is a type of statistical test that is used to compare the means of two groups. T-test are a type of para-metric method. A t-test is a type of inferential statistics used to determine if there is a significant difference between the means of two groups, which may be related in certain features.

T-test has three types: They are

- One sample t-test.
- Two sample t-test.
- Paired t-test.

B. Independent of t-test for two samples

The independent t-test also called the Two-Sample t-test, independent. Samples t-test or student's t-test is an inferential statistical test that determines whether there is a statistically significant difference between the means in two unrelated groups.

2. Hypertension Overview

A. Hypertension

A condition in which the force of the blood against the artery walls is too high. Usually, hypertension is defined as blood pressure above 140/90, and is considered severs if the pressure is above 180/120.

1) Sign and symptoms of hypertension

Most people with high blood pressure have no signs or symptoms, even if blood pressure readings reach dangerously high levels.

A few people with high blood pressure may have headaches, shortness of breath or nosebleeds, but these signs and symptoms aren't specific and usually don't occur until high blood pressure has reached a severe or life-threatening stage.

2) Classification of hypertension

- Primary or essential hypertension
- Secondary hypertension

3) Reason for hypertension

- Primary (essential) hypertension

For most adults, there's no identifiable cause of high blood pressure. This type of high blood pressure, called primary (essential) hypertension, tends to develop gradually over many years.

- Secondary hypertension

Some people have high blood pressure caused by an underlying condition. This type of high blood pressure, called secondary hypertension, tends to appear suddenly and cause higher blood pressure than does primary hypertension.

4) Treatment

By living a healthy lifestyle, you can help keep your blood pressure in a healthy range. Preventing high blood pressure, which is also called hypertension, can lower your risk heart disease and stroke.

3. Hypertension Patients Details

A. Hypertension details

The Hypertension patients' detail were collected from Government Hospital at Mannargudi during the year 2020-2021 from Medical Officer in the hospital. T-test was used to analyses the data patients detail.

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Table 1
Hypertension patients details

Months	Male	Female
January	10	8
February	25	15
March	30	20
April	22	14
May	9	12
June	6	12
July	18	18
August	18	19
September	30	18
October	27	26
November	31	13
December	31	48

B. Application of t-test in hypertensions

1) Male patient details

The table 2 shows the male patient details.

2) Female patient details

The table 3 shows the female patient details.

3) T-test calculation for male patients

$$\bar{X}_i = \sum \frac{X_i}{n}$$

$$\bar{X}_1 = \sum \frac{X_1}{n}$$

$$= \frac{259}{12}$$

$$\bar{X}_1 = 21.58$$

$$\sigma_1^2 = \frac{\sum (X_1 - \bar{X}_1)^2}{n-1}$$

$$= \frac{928}{12-1}$$

$$= \mathbf{\frac{928}{11}}$$

$$\sigma_1^2 = 84.3636$$

$$\sigma_1 = \sqrt{84.3636}$$

$$= 9.1849$$

$$t_1 = \frac{\bar{X}_1}{\sigma_1 \times \frac{\sqrt{n_1}}{n}}$$

$$t_1 = \frac{21.58}{9.1849 \times \frac{\sqrt{12}}{12}}$$

$$= \frac{21.58}{9.1849 \times 0.2887}$$

Table 2
T-test for male patients

Month	Male X_1	$\bar{X}_1$	$\sum (X_1 - \bar{X}_1)$	$\sum (X_1 - \bar{X}_1)^2$
January	10	21.58	-11.58	134
February	25	21.58	3.42	12
March	30	21.58	8.42	71
April	24	21.58	2.42	6
May	9	21.58	-12.58	158
June	6	21.58	-15.58	243
July	18	21.58	-3.58	13
August	18	21.58	-3.58	13
September	30	21.58	8.42	71
October	27	21.58	5.42	29
November	31	21.58	9.42	89
December	31	21.58	9.42	89
	$\sum X_1 = 258$		$\sum (X_1 - \bar{X}_1) = 0.04$	$\sum (X_1 - \bar{X}_1)^2 = 928$

Table 3
T-test for female patients

Month	Female X_2	$\bar{X}_2$	$\sum (X_2 - \bar{X}_2)$	$\sum (X_2 - \bar{X}_2)^2$
January	8	18.58	-10.58	112
February	15	18.58	-3.58	13
March	20	18.58	1.42	2
April	14	18.58	-4.58	21
May	12	18.58	-6.58	43
June	12	18.58	-6.58	43
July	18	18.58	-0.58	0.3369
August	19	18.58	0.42	0.1764
September	18	18.58	-0.58	0.3369
October	26	18.58	7.42	55
November	13	18.58	-5.58	31
December	48	18.58	29.42	866
	$\sum X_2 = 223$		$\sum (X_2 - \bar{X}_2) = 0.04$	$\sum (X_2 - \bar{X}_2)^2 = 1186.8502$

$$= \frac{21.58}{2.6516}$$

$$t_1 = 8.1384$$

4) T-test calculation for female patients

$$\bar{X}_i = \sum \frac{X_i}{n}$$

$$\bar{X}_2 = \sum \frac{X_2}{n}$$

$$= \frac{223}{12}$$

$$\bar{X}_2 = 18.58$$

$$\sigma_2^2 = \frac{\sum (X_2 - \bar{X}_2)^2}{n-1}$$

$$= \frac{1186.8502}{12-1}$$

$$= \frac{\mathbf{1186.8502}}{\mathbf{11}}$$

$$\sigma_2^2 = 107.8954$$

$$\sigma_2 = \sqrt{107.8954}$$

$$= 10.3872$$

$$t_2 = \frac{\bar{X}_2}{\sigma_2 \times \frac{\sqrt{n_2}}{n}}$$

$$t_2 = \frac{18.58}{10.3872 \times \frac{\sqrt{12}}{12}}$$

$$= \frac{18.58}{10.3872 \times 0.2887}$$

$$= \frac{18.58}{2.9987}$$

$$t_2 = 6.1901$$

4. Patients Details and T-test Using Graphs

A. Patient details using bar graph

1) Patient details – Hypertension

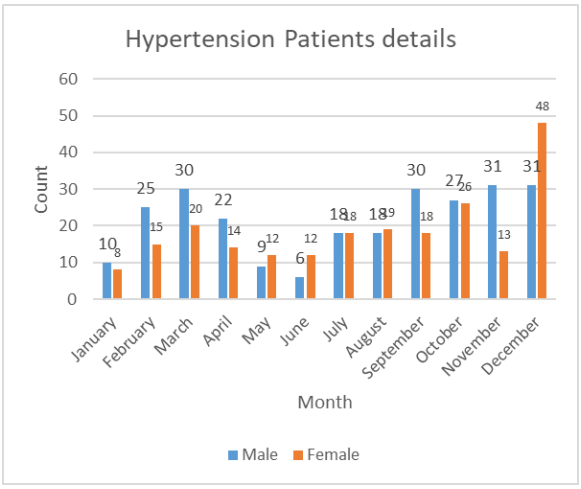


Fig. 1. Total hypertension patients details using graph

2) Patient details – Hypertension (Male)

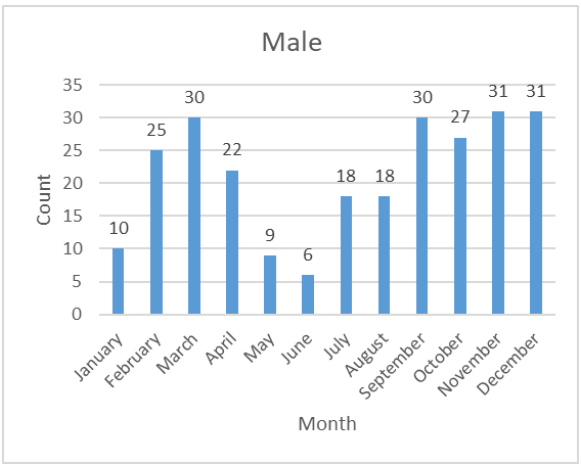


Fig. 2. Total male hypertension patient details using graph

3) Patient details – Hypertension (Female)

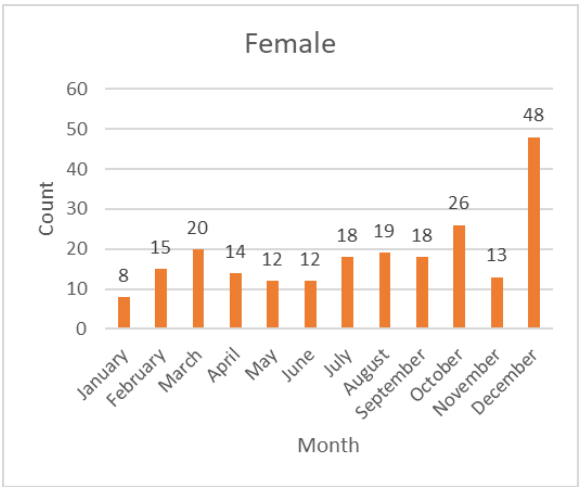


Fig. 3. Total female hypertension patient details using graph

B. Patient details using line graph

1) Patient details – Hypertension

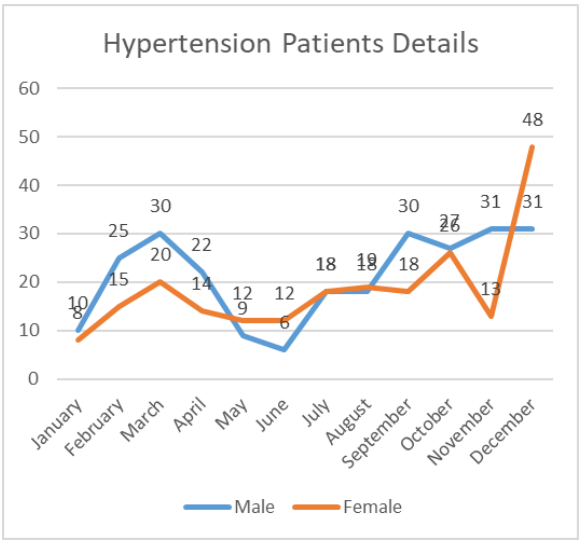


Fig. 4. Total male hypertension patient details using graph

2) Patient details – Hypertension (Male)

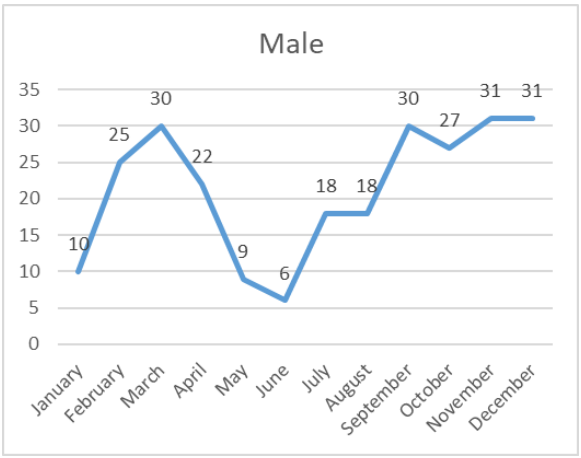


Fig. 5. Total male hypertension patient details using graph

3) Patient details – Hypertension (Female)

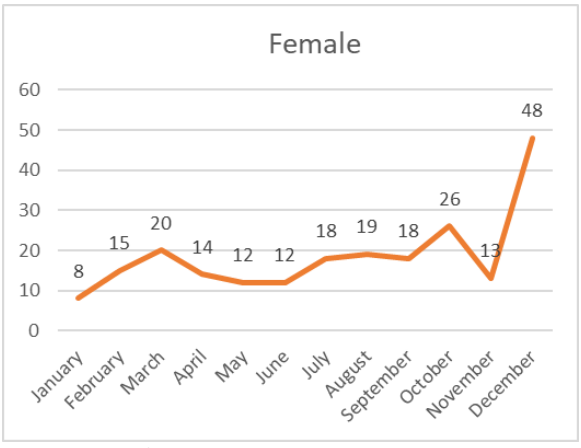


Fig. 6. Total female hypertension patients details using graph

5. Conclusion

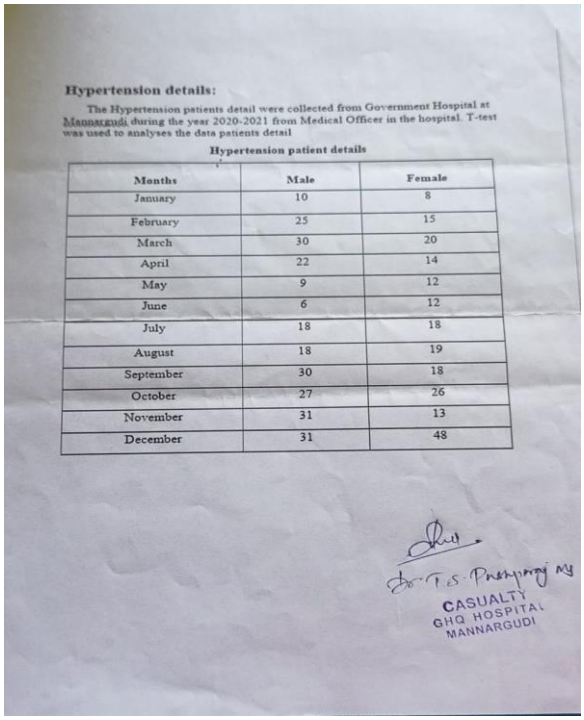
A. *Result*

The center for Disease Control and Prevention has found that the number of people suffering from Hypertension disease is gradually rising, with approximately 5 in 10 people likely to develop Hypertension in their lifetime leading to significant impact on health, workplace productivity and economic costs.

B. *Conclusion*

We conclude that there is a significant difference between the sample mean of male and female patients of Hypertension.

In satisfied way we conclude that the male patients are mostly affected by Hypertension disease during the year 2020 – 2021 in the particular area where our survey undertaken.



Hypertension details:

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Fig. 7. Hypertension details

The [1], [2] say how to make t-test of two samples. [3] say how to find the mean value of two samples. [4], [5] say how to analyze the data using statistics. [6] say how to put a graph for our data using Excel.

References

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