A Study on Mathematical Analysis of Blood Pressure Patients Using Statistics

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Abstract--**Blood pressure was mathematically analyzed using t-test method in the statistics of blood pressure patients at Tamil Nadu Government Hospital, Thiruthuraipoondi, Thiruvarur (Dt.) in 2020-2021.**

Keywords--**Data analysis, statistics.**

1. Introduction

The most important word quality of the word quality is Statistical quality of the word is statistical quality control. Quality control is a powerful manufacturing technique for effectively detecting defects or non-compliance with standards in materials, processes, machinery or finishing materials. The main purpose of Statistical Quality Control (S.Q.C) is to develop statistical technique that will help us in sorting out assignments.

- 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 is 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 t-test is an inferential statistical test that determines whether there is a statistically significant difference between the means in two unrelated groups.

2. Blood Pressure Overview

A. Blood Pressure (BP)

Blood pressure is the pressure of circulating blood against the walls of blood vessels. Most of this pressure results from the heart pumping blood through the circulatory system. When used without qualification, the term "Blood Pressure" refers to the pressure in the large arteries. It is measured in millimetres of mercury (mm hg).

1) Symptoms of blood pressure

Blood pressure usually has no warning signs or symptoms, and many people do not know they have it. Measuring your blood pressure is the only way to know whether you have high blood pressure.

2) Classification of blood pressure

- Hypertension (high blood pressure)
- Hypotension (low blood pressure)

3) Symptoms of hypertension

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.

4) Symptoms of hypotension

For some people, low blood pressure signals an underlying problem, especially when it drops suddenly or is accompanied by signs and symptoms such as:

- Dizziness or light-headedness
- Fainting
- Blurred or fading vision
- Nausea
- Fatigue
- Lack of concentration

5) Prevention

Blood pressure can often be prevented or reduced by eating healthily, maintaining a healthy weight, taking regular exercise, drinking alcohol in moderation and not smoking.

3. Blood Pressure Patients Details

A. Blood pressure details

The details of the Blood pressure patient at the Government Hospital in Thiruthuraipoondi for the year 2020-2021 were collected from the Blood Pressure Division Medical Officer at the hospital.

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Table 1
Blood pressure patient's details

Months	Male	Female
January	11	5
February	13	6
March	7	6
April	12	11
May	38	13
June	19	23
July	7	6
August	22	18
September	7	5
October	8	7
November	11	7
December	18	32

B. Application of t-test in blood pressure

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

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

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

$$= 173/12$$

$$\bar{X}_1 = 14.41$$

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

$$= \frac{1058}{12-1}$$

$$= \frac{1058}{11}$$

$$\sigma_1^2 = 96.18$$

$$\sigma_1 = \sqrt{96.18}$$

$$= 9.8071$$

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

$$t_1 = \frac{14.41}{9.8071 \times \frac{\sqrt{12}}{12}}$$

$$= \frac{14.41}{9.8071 \times 0.2887}$$

$$= \frac{14.41}{2.8313}$$

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	11	14.41	-3.41	12
February	13	14.41	-1.41	2
March	07	14.41	-7.41	55
April	12	14.41	-2.41	6
May	38	14.41	23.59	556
June	19	14.41	4.59	21
July	07	14.41	-7.41	55
August	22	14.41	7.59	58
September	07	14.41	-7.41	55
October	08	14.41	-6.41	41
November	11	14.41	-3.41	12
December	18	14.41	13.59	185
	$\sum X_1 = 173$		$\sum (X_1 - \bar{X}_1) = 10.08$	$\sum (X_1 - \bar{X}_1)^2 = 1058$

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	5	13	-8	64
February	6	13	-7	49
March	6	13	-7	49
April	11	13	-2	4
May	13	13	17	289
June	23	13	10	100
July	6	13	-7	49
August	18	13	5	25
September	5	13	-8	64
October	7	13	-6	36
November	7	13	-6	36
December	32	13	19	361
	$\sum X_2 = 156$		$\sum (X_2 - \bar{X}_2) = 17$	$\sum (X_2 - \bar{X}_2)^2 = 1126$

$$t_1 = 5.0895$$

4) T-test Calculation for female patients

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

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

$$= \frac{156}{12}$$

$$\bar{X}_2 = 13$$

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

$$= \frac{1126}{12-1}$$

$$= \frac{1126}{11}$$

$$\sigma_2^2 = 102.36$$

$$\sigma_2 = \sqrt{102.36}$$

$$= 10.117$$

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

$$t_2 = \frac{13}{10.117 \times \frac{\sqrt{12}}{12}}$$

$$= \frac{13}{10.117 \times 0.2887}$$

$$= \frac{13}{2.920}$$

$$t_2 = 4.4520$$

4. Patients Details and T-test Using Graphs

A. Patient details using bar graph

1) Patient details – Blood pressure
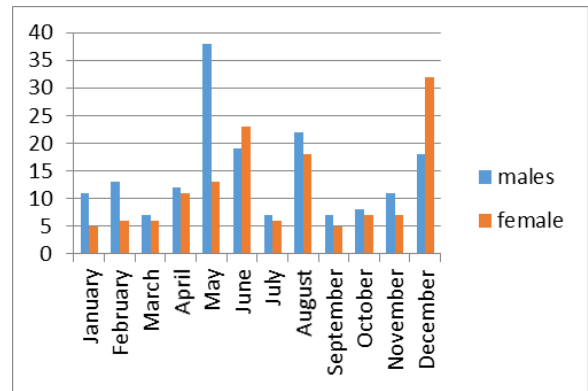
Fig. 1. Total blood pressure patients details using graph

2) Patient details – Blood pressure (Male)
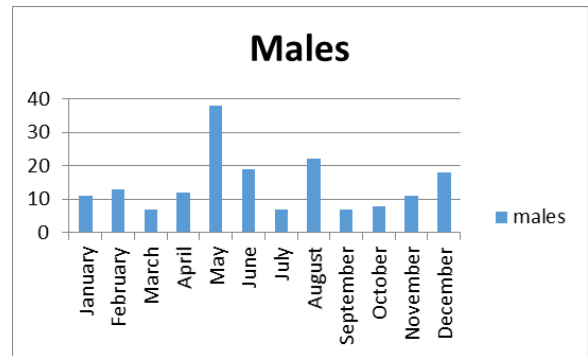
Fig. 2. Total male blood pressure patient details using graph

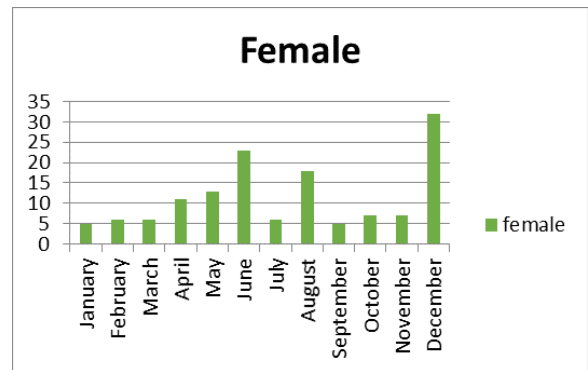*3) Patient details – Blood pressure (Female)*

Fig. 3. Total female blood pressure patient details using graph

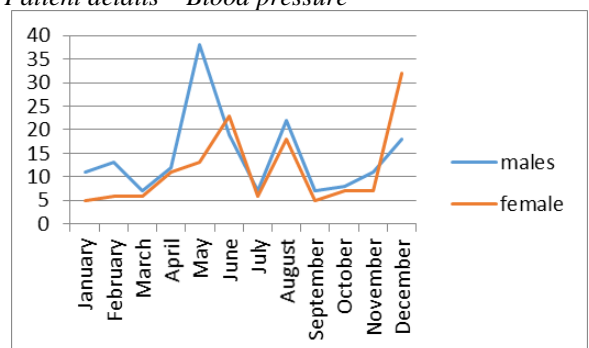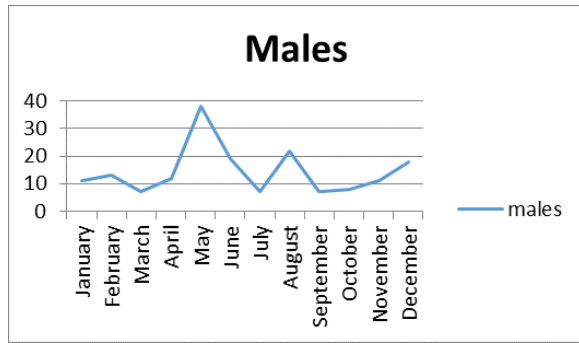*B. Patient details using line graph*

1) Patient details – Blood pressure

Fig. 4. Total blood pressure patient details using graph

2) Patient details – Blood pressure (Male)

Fig. 5. Total male blood pressure patient details using graph

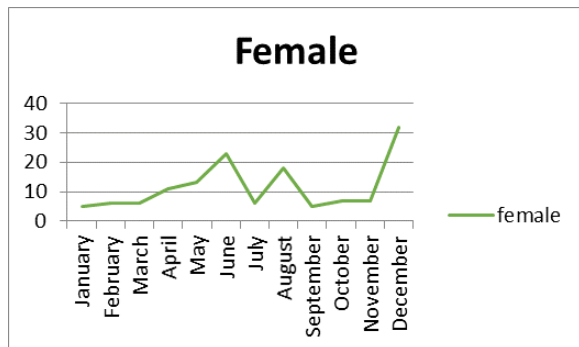*3) Patient details – Blood pressure (Female)*

Fig. 6. Total female blood pressure patients details using graph

The [1], [2] says 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.

5. Conclusion

A. Result

According to the Thiruthuraipoondi Government Hospital, the Center for Disease Control and Prevention has found that the number of people suffering from Blood pressure is gradually increasing by 2020-2021.

B. Reason

Too much salt, too little potassium, and too much alcohol have all been found to increase the risk of high blood pressure. Too much stress and too little physical activity both increase the danger of developing high blood pressure, as does being over weight or obese.

C. Conclusion

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

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

Fig. 7. Blood pressure patient details (2020-2021)

References

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