A Study on Mathematical Analysis of Cardiovascular Patients Using Statistics

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Abstract: Cardiovascular was mathematically analyzed using t-Test method in the statistics of cardiovascular patients at Tamil Nadu Government Hospital, vaduvur, 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. Cardiovascular Overview

A. Cardiovascular

Cardiovascular is a class of disease that involves heart or blood vessels. It's usually associated with a buildup of fatty deposits inside the arteries (atherosclerosis) and increased risk of blood clots. Cardiovascular disease was analyzed mathematically using t-test method in statistics of government hospital patients during the year 2020-2021.

1) Symptoms of Cardiovascular

Cardiovascular general symptoms include:

- Shortness of breath
- Cold sweat
- Pain, numbness, weakness or coldness in your legs or arms if the blood vessels in those parts of your body are narrowed.
- Chest pain, chest tightness, chest pressure and chest discomfort (angina)
- Pain in the neck, jaw, throat, upper abdomen or back.
- Difficulty seeing with one or both eyes.
- Loss of unconsciousness.

2) Classification of Cardiovascular

- Coronary artery disease.
- Rheumatic heart.

3) Symptoms of coronary artery disease

Signs and symptoms can appear relatively suddenly and may include:

- Vomiting
- Nausea
- Chest discomfort

4) Symptoms of Rheumatic heart disease

Signs and symptoms of Rheumatic heart disease develop slowly. When signs and symptoms are present, they may include:

- Heart palpitations
- Breathing problems when lying down

5) Treatment for Cardiovascular

Doctors treat cardiovascular with a few different

medications. Some of these drugs are taken by mouth, while others are available as injections.

- Coronary artery disease: Statin, which reduce cholesterol, reduce the risk of coronary artery disease.
- Rheumatic heart disease: Prolonged periods of antibiotics, valve replacement surgery, valve repair.

6) Prevention

Upto 90% of cardiovascular may be preventable if established risk factors are avoided. CVD involves improving risk factors through: Healthy eating, exercise, avoidance of tobacco smoke and limiting alcohol intake.

3. Cardiovascular Patients Details

A. Cardiovascular details

Table 1
Cardiovascular patient's details

Months	Male	Female
January	10	07
February	06	03
March	07	09
April	05	04
May	01	02
June	06	04
July	04	05
August	04	06
September	08	07
October	06	09
November	04	05
December	05	04

The details of the Cardiovascular patient at the Government Hospital in vaduvur for the year 2020-2021 were collected from the Medical Officer at the hospital.

B. Application of t-test in cardiovascular

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

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

$$X_1 = \sum \frac{X_1}{n}$$

$$= \frac{66}{12}$$

$$\bar{X}_1 = 5.5$$

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

$$= \frac{57}{12-1}$$

$$= \frac{57}{11}$$

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	5.5	4.5	20.25
February	06	5.5	0.5	0.25
March	07	5.5	1.5	2.25
April	05	5.5	-0.5	0.25
May	01	5.5	-4.5	20.25
June	04	5.5	0.5	0.25
July	04	5.5	-1.5	2.25
August	08	5.5	-1.5	2.25
September	08	5.5	2.5	6.25
October	06	5.5	0.5	0.25
November	04	5.5	-1.5	2.25
December	05	5.5	-0.5	2.25
	$\Sigma x_1 = 66$		$\sum (X_1 - \bar{X}_1) = 0$	$\sum (X_1 - \bar{X}_1)^2 = 57$

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	07	5.42	1.58	2.4964
February	03	5.42	-2.42	5.8564
March	09	5.42	3.58	12.8164
April	04	5.42	-1.42	2.0164.
May	02	5.42	-3.42	11.6964
June	04	5.42	-1.42	2.0164
July	05	5.42	-0.42	0.1764
August	06	5.42	-0.58	0.3364
September	07	5.42	1.58	2.4964
October	09	5.42	3.58	12.8164
November	05	5.42	0.42	0.1764
December	04	5.42	-1.42	2.0164
	$\sum X_2 = 65$		$\sum (X_2 - \bar{X}_2) = 0.04$	$\sum (X_2 - \bar{X}_2)^2 = 54.9168$

$$\sigma_1^2 = 5.181818$$

$$\sigma_1 = \sqrt{5.181818}$$

$$\sigma_1 = 2.27636$$

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

$$t_1 = \frac{5.5}{2.27636 \times \frac{\sqrt{12}}{12}}$$

$$= \frac{5.5}{2.2764 \times 0.2887}$$

$$= \frac{5.5}{0.65719}$$

$$t_1 = 8.36896$$

4) T-test calculation for female patients

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

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

$$= \frac{65}{12}$$

$$\bar{X}_2 = 5.42$$

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

$$= \frac{54.9168}{12-1}$$

$$= \frac{54.9168}{11}$$

$$\sigma_2^2 = 4.9924$$

$$\sigma_2 = \sqrt{4.9924}$$

$$\sigma_2 = 2.23436$$

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

$$t_2 = \frac{5.42}{2.23436 \times \frac{\sqrt{12}}{12}}$$

$$= \frac{5.42}{2.23436 \times 0.2887}$$

$$= \frac{5.42}{0.64506}$$

$$t_2 = 8.402319$$

4. Patients Details and T-test Using Graphs

A. Patient details using bar graph

1) Patient details – cardiovascular
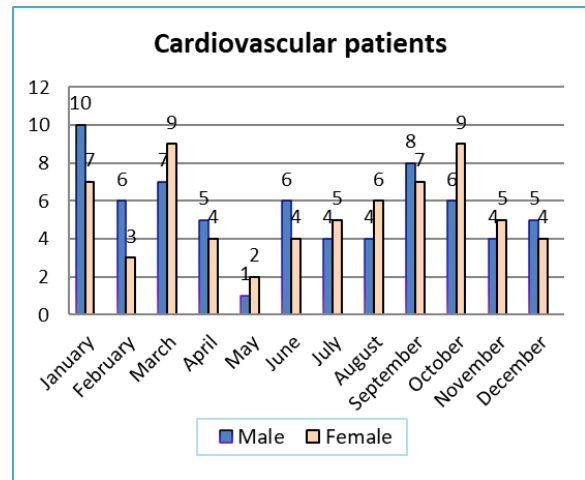
Fig. 1. Total cardiovascular patients' details using graph
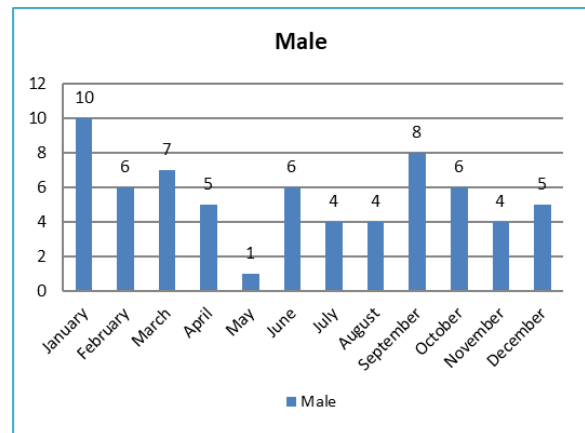
2) Patient details-cardiovascular (Male)

Fig. 2. Total male cardiovascular patients' details using graph
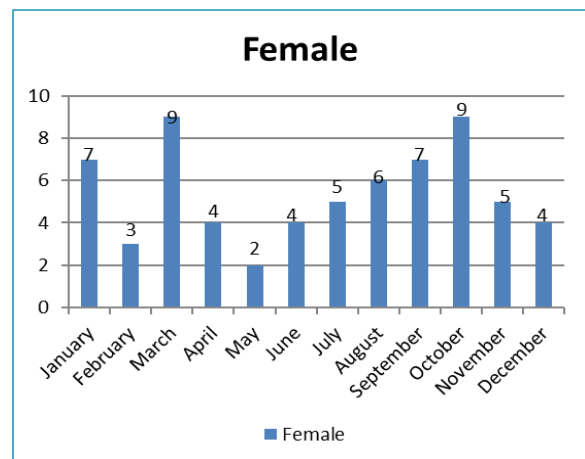
3) Patient details-cardiovascular (Female)

Fig. 3. Total female cardiovascular patient details using graph

B. Patient details using line graph
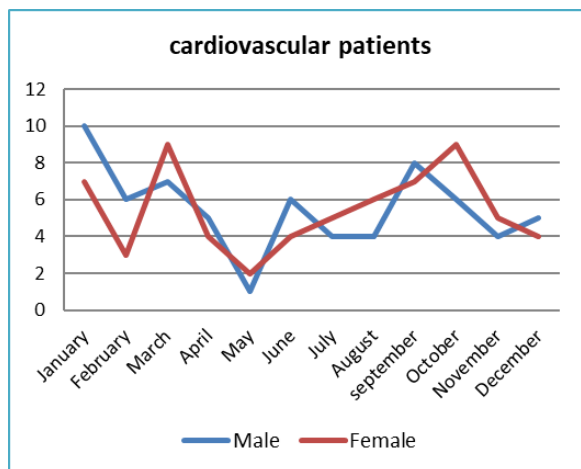
1) Patient details – Cardiovascular

Fig. 4. Total cardiovascular patient details using graph
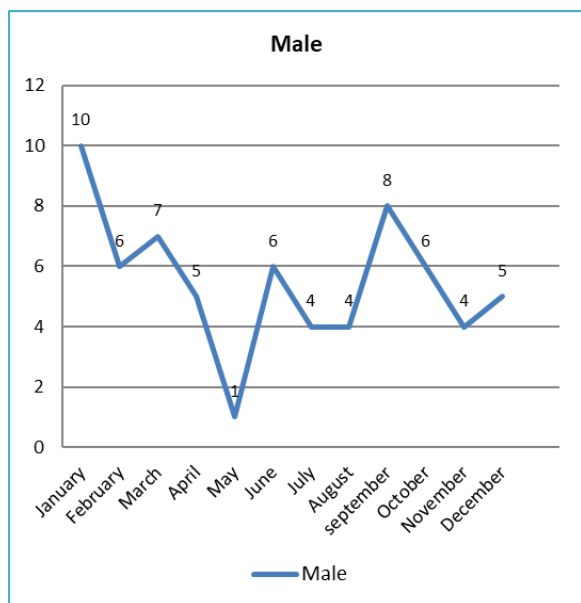
2) Patient details – Cardiovascular (Male)

Fig. 5. Total male cardiovascular patient details using graph
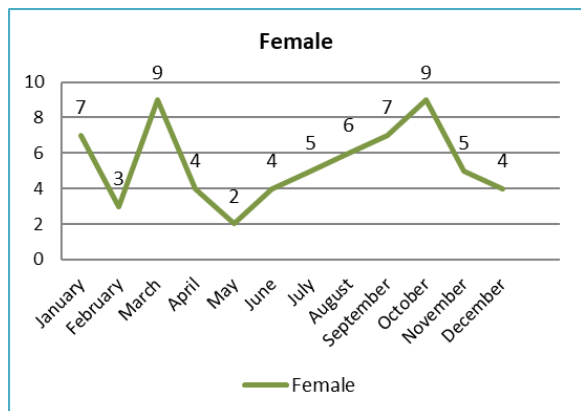
3) Patient details – Cardiovascular (Female)

Fig. 6. Total female cardiovascular patients' details using graph

5. Conclusion

A. Result

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

B. Reason

1) Reason for coronary artery disease

Doctors do not know exactly what causes coronary artery disease is plaque buildup in the wall of the arteries that supply blood to the heart plaque is made up of cholesterol deposits. Plaque buildup causes the inside of the arteries to narrow over time.

2) Reason for Rheumatic heart disease

Rheumatic heart diseases is caused by rheumatic fever, an inflammatory disease that can affect many connective tissues especially in the heart, joints, skin, or brain.

C. Conclusion

We conclude that there is a significant difference between the male and female sample averages of cardiovascular.

Satisfactorily, in 2020-2021, we conclude that in the specific area where our survey was conducted, female patients are more likely to suffer from cardiovascular.

Fig. 7. Heart disease patients' 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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