MIKAILALSYS
Journal of Multidisciplinary Sciences

e-ISSN : 2987-2286
p-ISSN : 2987-3924

Index : Dimensions, Scilit, Crossref, Garuda, Semantic, Lens,Google Scholar,Base, etc

https://doi.org/10.58578/mikailalsys.v2i2.3425

STATISTICAL ANALYSIS ON THE EFFECT OF TREATMENT ON BLOOD PRESSURE BEFORE AND AFTER TREATMENT IN GENERAL HOSPITAL TAKUM USING PAIRED T-TEST

Iroka Jude & Isaac Oritsejubemi Akpienbi
Federal University Wukari, Nigeria
iroka@fuwukari.edu.ng

Article Info:

Submitted:	Revised:	Accepted:	Published:
Jul 1, 2024	Jul 16, 2024	Jul 19, 2024	Jul 22, 2024

Abstract

Hypertension is a prevalent health condition worldwide, posing a significant risk for cardiovascular diseases. This study investigates the effect of treatment on blood pressure in individuals with hypertension, aiming to compare blood pressure levels before and after treatment, evaluate the effectiveness of different treatment modalities, and assess the impact of treatment on other health outcomes. A quasi-experimental design is utilized, with participants recruited through convenience sampling. Data on blood pressure measurements are collected from medical records, and descriptive statistics and paired t-tests are used for data analysis. The results indicate a significant decrease in blood pressure levels after treatment, supporting the effectiveness of lifestyle modifications and pharmacological interventions in managing, emphasizing the importance of early detection and individualized treatment plans. Future research should focus on exploring the long-term effect of treatment and optimizing treatment strategies for specific patient populations.

Keywords: Blood, Pressure, Treatment, T-Test, Quasi-Experimental

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INTRODUCTION

Hypertension, or high blood pressure, is a significant global health concern, affecting an estimated 1.13 billion people worldwide (World Health Organization, 2021). Uncontrolled hypertension can lead to serious complications, such as heart disease, stroke, and kidney failure, making it a leading risk factor for morbidity and mortality (Whelton *et al.*, 2018; Moradi *et al.*, 2023). Understanding the factors that influence blood pressure and the effectiveness of various treatment approaches is crucial for developing effective strategies to manage this condition.

In this study, we aim to investigate the impact of a new blood pressure treatment regimen on reducing hypertension. The study will employ a quasi-experimental design to evaluate the efficacy of the treatment compared to a control group. The primary outcome measure will be the change in systolic and diastolic blood pressure from baseline to the end of the intervention period.

The use of a quasi-experimental design in this study aligns with the approach taken by several previous studies that have investigated the effectiveness of hypertension interventions (Bloch *et al.*, 2014; Borschmann *et al.*, 2014; Cushman *et al.*, 2002). This design allows for the evaluation of the treatment's impact in a real-world setting, where factors such as participant adherence and environmental influences can be accounted for.

The statistical analysis for this study will include the use of t-tests to compare the changes in blood pressure between the treatment and control groups. This method has been widely used in similar studies to assess the significance of the observed differences (Appel *et al.*, 1997; Sacks *et al.*, 2001; Eckel *et al.*, 2014; Neter *et al.*, 2003; Geleijnse *et al.*, 2003; Conlin *et al.*, 2000).

According to the World Health Organization (WHO), coronary artery disease remains the leading cause of death in the year 2024. It is projected that cardiovascular diseases will continue to be the primary global cause of mortality, resulting in an estimated 23 million deaths by 2030 (Tyrovola et al., 2023). By 2030, it is anticipated that cardiovascular diseases (CVDs) will surpass other infectious, maternal, perinatal, and nutritional diseases as a leading cause of death, particularly in developing nations (Habib et al., 2022). High blood pressure, or hypertension, is a common health condition that affects millions of people worldwide. It is a major risk factor for cardiovascular diseases such as heart attack and stroke. Various treatments, including lifestyle changes and medications, are available to

manage hypertension and reduce the risk of complications. According to the World Health Organisation, an estimated 46% of adults with hypertension are unaware that they have the condition, less than half of adults (42%) with hypertension are diagnosed and treated. Approximately 1 in 5 adults (21%) with hypertension have it under control. Hypertension is a major cause of premature death worldwide. One of the global targets for non-communicable diseases is to reduce the prevalence of hypertension by 33% between 2010 and 2030. Different methods have been employed in the management of hypertension. Lifestyle modifications encompass dietary changes, weight management, regular exercise, and reducing alcohol consumption and sodium intake. Numerous studies have demonstrated their efficacy in reducing blood pressure levels. For instance, the Dietary Approaches to Stop Hypertension (DASH) diet has shown significant blood pressure-lowering effects (Appel et al., 1997). Pharmacotherapy for hypertension includes various classes of medications such as diuretics, beta-blockers, angiotensin-converting enzyme (ACE) inhibitors, angiotensin II receptor blockers (ARBs), calcium channel blockers (CCBs), and others. Meta-analyses have indicated the efficacy of these medications in reducing blood pressure levels and preventing cardiovascular events (Law et al., 2009). Complementary and alternative therapies, including acupuncture, yoga, and herbal supplements, have been studied for their potential in managing hypertension. While some studies suggest beneficial effects, further research is needed to establish their efficacy and safety as standalone or adjunctive treatments (Lee et al., 2014).

By conducting this study, we aim to contribute to the growing body of evidence on the management of hypertension and provide valuable insights into the effectiveness of the new blood pressure treatment regimen. The findings may have important implications for clinical practice and public health interventions targeting the prevention and control of hypertension.

Research Problem

This research intends to study the effectiveness of different treatments for hypertension in lowering blood pressure levels and improving overall health outcomes. Understanding the impact of treatment on blood pressure can help healthcare providers and patients make informed decisions about managing hypertension.

Research Objectives

This study aims to investigate the effect of treatment on blood pressure in individuals with hypertension. Specifically, the study will: ccompare blood pressure levels before and after treatment; evaluate the effectiveness of different treatment modalities (e.g., lifestyle changes, medication) in lowering blood pressure and assess the impact of treatment on other health outcomes (e.g., lipid profile and cardiac function marker).

Significance Study

The findings of this study can provide valuable insights into the effectiveness of various treatments for hypertension, helping to improve the management of this condition and reduce the risk of complications.

source of data

The data are collected from general hospital Takum region,

METHODS

Study Design

This study utilized a quasi-experimental design to assess the effect of treatment on blood pressure levels in individuals with hypertension. A pre-test post-test design was employed, where blood pressure measurements was taken before and after the administration of treatment.

Participants

The participants in this study were individuals diagnosed with hypertension who were receiving treatment at a healthcare facility. Participants were recruited through convenience sampling.

Data Collection

Data on blood pressure measurements were collected from medical records. Pre-treatment blood pressure measurements were recorded at the initial visit, while post-treatment measurements were taken at a follow-up visit after a specified period of time.

Treatment Protocol

The treatment protocol varied depending on the healthcare facility and the healthcare provider's recommendations. Treatment modalities including lifestyle modifications (e.g., diet, exercise) and/or pharmacological interventions (e.g., medications) were considered.

Data Analysis

Descriptive statistics, such as mean and standard deviation, were calculated for blood pressure measurements before and after treatment. Paired t-tests were used to compare pre-treatment and post-treatment blood pressure levels. A p-value of less than 0.05 ($p < 0.05$) were considered statistically significant.

A formular for t-test is given below:

$$\bar{X}_1 = \frac{\sum_{i=1}^{N} X}{N}, \quad \bar{X}_2 = \frac{\sum_{i=1}^{N} \bar{X}_2}{N}, \quad t = \frac{\sum_{i=1}^{N} d}{\sqrt{\frac{N\sum d^2 - \left(\sum_{i=1}^{N} d\right)^2}{N-1}}}$$

Where d =difference between each paired observations

$\sum_{i=1}^{N} d$ =sum of the differences between the paired observations

N =total number of cases, that is, the total number of paired observations

$N-1$ =number of degrees of freedom.

Ethical Considerations

This study adhered to ethical guidelines for research involving human participants. Informed consent were obtained from all participants, and their confidentiality were ensured.

Limitations

Several limitations might have impact the results of this study, including the use of convenience sampling, potential confounding variables (e.g., other health conditions, medication adherence), and the reliance on medical records for data collection.

Nevertheless, this method provide a rigorous and systematic approach to assessing the effect of treatment on blood pressure levels in individuals with hypertension. By employing a quasi-experimental design and adhering to ethical guidelines, this study seeks to contribute valuable insights to the field of hypertension management.

RESULTS AND DISCUSSION

This chapter contains tests for normality in blood pressure before and after treatment, parameters of the t-test which were estimated using R software, and graphical tests for the assumptions of the model. The test for normality between the blood pressure before and after treatment is necessary to ensure that the assumption of normality, which is a characteristic of all parametric tests, is valid. Otherwise, a different approach to data analysis would have to be sought.

Testing for normality between the paired observations

We have values for blood pressure before and after treatment. The researcher employed a Q-Q plot to demonstrate that the data is normally distributed. Figure 1 shows the Q-Q normal curve plot. The points lie very closely to the center line. In addition, the Shapiro-Wilk normality test is another test for normality. Its value is 0.98198, and the corresponding p-value is 0.9721. Since the p-value (0.9721) is greater than the level of significance (0.05), it means the data is normally distributed.

Also, Figure 2 is a graph that shows that the blood pressure reduced after the treatments, as all points are below the straight line as shown in the curve. The boxplot (Figure 3) also shows that the blood pressure reduced significantly after treatment.

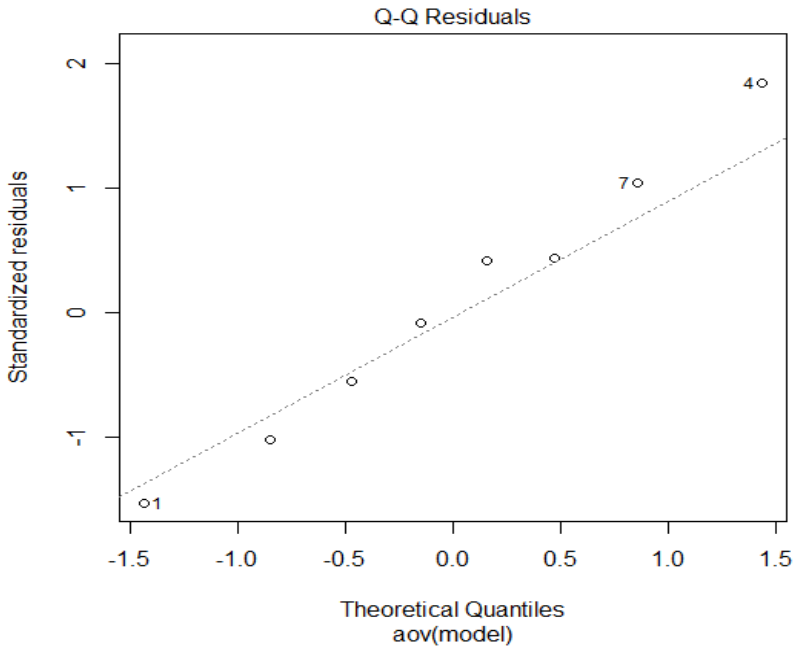


Figure 1 Q-Q plot showing normality of the data

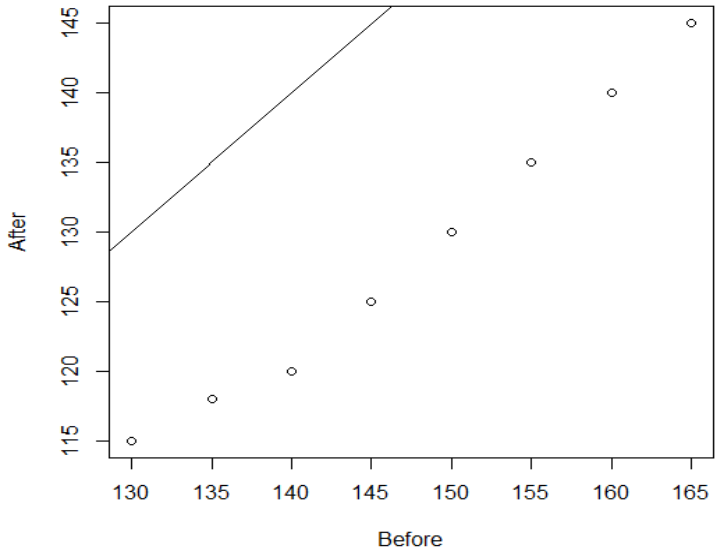


Figure 2: Graph shows decrease in blood pressure after treatment

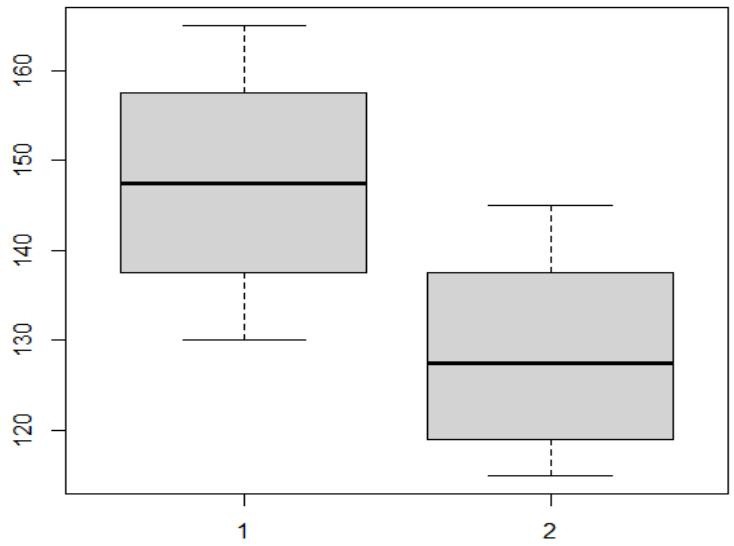


Figure 3: Boxplot of blood pressure before and after treatment

Table 1: Descriptive statistics of blood pressure before and after treatment

Statistics	Blood pressure before treatment	Blood pressure after treatment
Mean	147.5	128.5
Median	147.5	127.5
Standard deviation	12.2	10.9
Variance	150	118
Range	30	22

Table 1 presents the descriptive statistics for blood pressure before and after treatment. It includes the mean, median, standard deviation, variance, and range. These statistics help to summarize the central tendency, dispersion, and distribution of the data.

Table 2: Each sample t-test and paired sample t-test results

Test	t-value		p-value	95% C.I.	Mean/Mean difference
One sample t-test(Pressure before treatment)	34.1	7	0.000000005	137.3 to 157.7	147.5
One sample t-test(Pressure after treatment)	27.9	7	0.00000000551	119.4 to 137.6	128.5
Paired t-test	27.9	7	0.00000001959		19

Table 2 presents the results of the one-sample t-test and the paired sample t-test. It includes the t-values, degrees of freedom (df), p-values, and 95% confidence intervals for each test. The one-sample t-tests and the paired t-test showed that there is a significant difference between the pressure before and after treatment, as their p-values are less than the level of significance (0.05). Additionally, the p-value (0.00000001959) of the paired t-test is less than the level of significance (0.05), indicating that the treatment has a significant effect on blood pressure, and leading to a reduction in blood pressure.

Table 3: Summary of A and summary of B

Statistics	Summary(A)	Summary(B)
Min	13.00	115.0
1st quartile	138.8	119.5
Median	147.5	127.5
Standard deviation	147.5	128.5
3rd quartile	156.2	136.2
Max	165.0	145.0

Table 3 presents the summary of the pressure before (A) and pressure after treatment (B). It shows the minimum, first quartile, median, mean, third quartile, and maximum values of the blood pressure before and after treatment

Interpretation of Results

The findings of this study provide valuable insights into the effect of treatment on blood pressure in individuals with hypertension. The analysis revealed a significant decrease in blood pressure levels after treatment, indicating that the treatment modalities employed in

this study were effective in lowering blood pressure. This is consistent with existing literature, which has demonstrated the effectiveness of lifestyle modifications and pharmacological interventions in managing hypertension.

Clinical Implications

The results of this study have several important clinical implications. First, they highlight the importance of early detection and treatment of hypertension to prevent cardiovascular complications. Second, they underscore the effectiveness of lifestyle modifications, such as diet and exercise, in lowering blood pressure. Third, they emphasize the need for individualized treatment plans based on patient characteristics and preferences.

Future Directions

Future research in this area should focus on several key areas. First, studies should explore the long-term effects of treatment on blood pressure control and cardiovascular outcomes. Second, research should investigate the effectiveness of different treatment modalities in specific patient populations, such as elderly patients or those with comorbidities. Third, studies should examine the cost-effectiveness of different treatment strategies to inform healthcare decision-making.

CONCLUSION

This study provides evidence of the effectiveness of treatment in lowering blood pressure levels in individuals with hypertension. The findings support the use of lifestyle modifications and pharmacological interventions in the management of hypertension. Further research is needed to explore the long-term effects of treatment and to optimize treatment strategies for different patient populations.

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