On Regression Analysis of The Relationship Between Age And Blood Cholesterol On Blood Pressure.

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Abstract:- This paper investigates the relationship of Age and Blood cholesterol on systolic blood pressure. The data used for this paper were obtained from Ekiti State University Teaching Hospital, Ado Ekiti. People wondered if high blood pressure is a function of age or that the effect of high blood cholesterol is manifested in the high blood pressure. A multiple regression analysis was used for the study. At the end of the analysis, Age and systolic blood pressure were seen to have a significant relationship with each other. Also, blood cholesterol and age were found to have significant relationship with systolic blood pressure. The result shows a degree of relationship between the blood pressure and the blood cholesterol. Increase in blood cholesterol signifies increase in blood pressure of a man which can easily lead to an abnormal blood pressure e.g. high blood pressure.

Keywords: Age, systolic, regression, parameters, hypotheses

Introduction

Age, blood cholesterol and blood pressure are biological occurrence which are associated to man and other animals. This process is very important as it determines the state of well being and health level of a man. Blood pressure is the measurement of how much force the blood exerts on the wall of blood vessels. There are many events occur within the body as the heart pumps bloods, known as the cardiac cycle, and so pumps blood is measure at different point throughout this cycle. Systolic blood pressure measure the maximum pressure in the arteries during the cardiac cycle, which occurs when the heart contract or beat to pump blood. Blood pressure is affected by medication, cardiovascular or urological disorders, neurological conditions and psychological factors such as stress or anger. Even diet and posture can play a role, because there are so many variables, healthy blood pressure readings can fall anywhere inside a large range. A healthy adult will have systolic blood pressure between 90 and 135 mm Hg. Some of the ways to lower the blood pressure reading is by increasing physical activities, curbing alcohol consumption and increasing food content in the diet. One exceptional method of reducing the blood pressure of man is dependent on some factors that means there are some factors that influence the level of blood pressure reading in the body such factors are Age and blood cholesterol. Blood cholesterol is a fatty substance that occurs naturally in the body and which is necessary for hormone production, cell metabolism and other vital process. Having high cholesterol level in the blood can increase the risk of heart diseases and stroke. Blood cholesterol is also a factor that affects blood pressure. High blood cholesterol does not automatically lead to high blood pressure but many of the activities and the same life habits that may increase blood cholesterol may also cause elevated blood pressure. Example include diet high in saturated fat, lack of physical activities, taking too much of alcohol amongst others. Age is considered medically as one of the major factors that affect the blood pressure of an adult. Age being the number of years of existence from birth to the present time is not determined by any factor, it is a compulsory biological change that cannot be controlled. Age comes along with growth, development and death. The more years you spend as an adult the less active your body system becomes and this is where age is got something to do with blood pressure related to the blood pressure. Age brings about accumulation and depreciation and with this greater risk of medical instability, so age bring about a change in the blood pressure of man as it is shown in this paper.

Data And Methodology

This research is aimed at finding out whether Age and Blood cholesterol has any effect on the blood pressure. Data for the study were obtained from Ekiti State Teaching Hospital, Ado Ekiti. Regression analysis was used in this study. We analyzed data containing more than two categorical variables by using multiple regression procedure. PASW (18) was used in estimating the parameters of the model. Regression models are used when the behaviour of one variable is 'explained' by changes in other variables. A statistical model takes account of the inherent variability of the data: this will arise because of measuring or observational errors or chance circumstances.

Multiple Linear Regression

This is applicable when we have multivariate data. A multiple linear regression model relates a response variable Y to more than one explanatory variable. The main purpose of the multiple regression analysis is to find which explanatory variables contribute to the variation of the response variable.

Model:

$$y_i = \beta_0 + \beta_1 x_{1i} + \beta_2 x_{2i} + \cdots + \beta_k x_{ki} + \varepsilon_i , \qquad i = 1,2,...n.$$

where: k is the number of explanatory variables,

β_0 , $\beta_1, \cdots \beta_k$ are the parameters of the model,

ε_i is a random error term.

Interpretation and Discussion of Results

The analysis of the data used for the purpose of this paper is discussed here. Predictive Analytic Software (PASW) was employed for the estimation of parameters and other calculations. The results obtained are shown in tables 1, 2, 3, 4 and 5 respectively. We want to see whether age and blood cholesterol have any relation on blood pressure. In doing this we are going to employ multiple regression analysis to test the

level of significance. The regression equation is given as:

$$\gamma = \beta_0 + \beta_1 X_1 + \beta_2 X_2$$

Where:

Y = Blood pressure

X_1 = Age

X_2= Blood Cholesterol and $\beta_0 =$ Intercept

The regression equation for the estimation of blood pressure $\gamma = 80.346 + 0.492 X_1 + 0.166 X_2$. The coefficient of

Determination r^2 (0.818) explained the value of dependent variable (y) blood pressure. It also shows the fitness level of the regression equation. The R Square (R^2) measures the % of variation that is explained by the model. That is from table 1 model 81.8 % of the variation in the y-variable (blood pressure) was explained by the model. It can be seen from table 4 that the point pairs of the blood pressure which forms the response variable and age which is the explanatory variable form a trend of scattered diagram that is almost a positive association. By implication blood pressure increased as the age increased which indicates that age is significant in the change of blood pressure of man. Looking at the scatter diagram (of X against Y)formed by the blood pressure reading of the sample observed and the blood cholesterol in table 5, it can be deduced that there is also positive association between the two variables. The trend shows that as blood cholesterol increases the blood pressure also increases, showing that blood cholesterol affect the blood pressure in a direct proportion.

Testing Parameters' Significance

To know whether the x-variables are jointly significant, we refer to table (2) and conclude that If the regression is not significant, then y (blood pressure) does not depend on the x's (i.e Age and blood cholesterol).
The hypotheses may be written as:

$$H_0 : \beta_1 = \beta_2 = \cdots = \beta_k = 0,$$
$$\text{model} : y_i = \beta_0 + \varepsilon_i$$
$$H_1 : \textit{at least one of the } \beta_i \neq 0$$
$$\text{model: } y_i = \beta_0 + \beta_1 x_{1i} + \beta_2 x_{2i} + \cdots + \beta_k x_{ki} + \varepsilon_i$$

Test Statistic $$F = \frac{MS(regression)}{MS(residual)}$$

Reject H_0 if $\text{calculated } F > F_{k,n-k,\alpha}$. Conclude that y (blood pressure) depends on x (Age and Blood Cholesterol). Otherwise accept the null hypothesis and conclude that y (blood pressure) does not depend on the x's.
The F-value is 37.308 with 2 and 37 degrees of freedom and p = 0.000, a result that is highly significant indicating that the x-variables are jointly significant. Also from table 3 we want to know whether the x-variables individually are significant The *slopes* (B) represent the amount by which y changes for every unit change in one of the x's while the rest of the x's remain constant i.e. If Blood Cholesterol increases by one unit while all the other variables remain constant the y-variable (Blood pressure) will increase by 0.166. The intercept represents the value of y when all the x's are zero.

Hypothesis test about β_i :

$H_0 : \beta_i = 0$ There is no linear relationship between x_i and y given the rest of the x-variables

$H_1 : \beta_i \neq 0$ There is a linear relationship between x_i and y given the rest of the x- variables

Test Statistic: $$T = \frac{\hat{\beta}_i}{std.Error(\hat{\beta}_i)}$$

Reject H_0 if $T > t_{n-k,\alpha/2}$ or $T < -t_{n-k,\alpha/2}$

Otherwise Accept the null hypothesis

$H_0 : \beta_2 = 0$ No relationship between Blood cholesterol and Blood pressure given Age

$H_1 : \beta \neq 0$ There is a linear relationship given the rest

Observed T = 3.896 and p = 0.000
Hence evidence to reject the null hypothesis and conclude that there is a linear relationship between Blood Cholesterol and Blood pressure given Age. Also from the table 3 Age is significant given the rest of the variables.

Conclusion And Recommendation

Based on the results obtained we conclude that there exist a significant relationship between age and blood cholesterol on systolic blood pressure. It could be seen from the analysis that the blood pressure of a man is related to his age and blood cholesterol. The relationship between the blood pressure, blood cholesterol and age using least square regression method has been tackled to a reasonable extent. Government at every level should sensitize their subjects on the need to reduce any food that can increase the level of blood cholesterol in the body viz a fatty food. It is well understood from this study that the level of blood pressure reading in the body can be influenced by age and blood cholesterol, therefore it is advisable for every individual above the age of 18years to be going for medical check- up at least once in 3 months. Due to this, if there exist any changes in their body system, it can easily be traced and be managed.

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Tables

Variables Entered/Removed (b)

Model	Variables Entered	Variables Removed	Method
1	X2, X1(a)	.	Enter

a. All requested variables entered.
b. Dependent Variable: Y

Table 1:Model Summary

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate	Change Statistics				
	R Square Change	F Change	df1	df2	Sig. F Change	R Square Change	F Change	df1	df2
1	.818(a)	.669	.651	8.30174	.669	37.308	2	37	.000

a. Predictors: (Constant), X2, X1

Table 2: ANOVA (b)

Model		Sum of Squares	Df	Mean Square	F	Sig.
1	Regression	5142.399	2	2571.199	37.308	.000(a)
	Residual	2550.001	37	68.919		
	Total	7692.400	39			

a. Predictors: (Constant), X2, X1
b. Dependent Variable: Y

Table 3: Coefficients (a)

Model		Unstandardized Coefficients		Standardized Coefficients	T	Sig.
		B	Std. Error	Beta	B	Std. Error
1	(Constant)	80.346	8.404		9.560	.000
	X1	.492	.086	.582	5.715	.000
	X2	.166	.043	.397	3.896	.000

a. Dependent Variable: Y