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“STATISTICAL ANALYSIS OF RISK FACTORS IN THE ASSESSMENT OF HEART ATTACK IN SANGLI, MIRAJ & KUPWAD CITY OF MAHARASHTRA STATE”

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Abstract: The goal of present research paper was to find the significant factors affecting on heart attack and to predict the pulse rate of patients by using the independent variables like gender, age, area of living, oxygen level, high blood pressure, diabetes of patients who are suffering for heart attack. The study was carried out among 100 heart attack patients. With the help of multiple linear regression, we found that the variables gender, age, high blood pressure and diabetes are significantly contributed to predict the pulses of heart attack patients. Thus, the most important risk factors that affect the heart attack are gender, age, high blood pressure and diabetes.

Keywords: Heart attack, diabetes, high blood pressure, regression.

1. Introduction:

Heart attack is very common disease in today's life. It is also called as cardiovascular disease. Heart attack happens when blood flow to the heart is blocked or cut off. If there is not sufficient oxygen rich blood flowing to the heart, it can cause damage to the affected area. As a result, the muscles begin to die. When your heart isn't getting the blood and oxygen it needs to function properly, it can put you at a higher risk of heart failure and other serious complications.

There are so many major risk factors can affect the heart attack or heart beats, such as high blood pressure, Diabetes, Cholesterol level, Obesity, ...etc. High blood pressure is very common risk factors can affect the heart disease. When your blood pressure is high, it makes your heart have to work harder. i.e. Your heart works harder to pump blood. High blood pressure can strain your heart, damage blood vessel and increase your risk of heart attack.

Diabetes is most risky factor to damage heart, especially it is not controllable. Nearly 68% of diabetes over the age of 65 die from heart attack. The older you get, the more you are at risk of heart attack. Although you have a heart attack

at any age the risk increases significantly after age of 45 for men and 50 for women.

Kannel WB et al. (1971) carried out the comparative study of systolic versus diastolic blood pressure and risk of coronary heart disease. Peter W. F. et al. (1998) predicted the Coronary Heart Disease Using Risk Factor Categories. Present study deals about the prediction of pulse of patients by using the independent variables like gender, age, area of living, oxygen level, high blood pressure, diabetes of patients who are suffering for heart attack and to find the risk factors affecting on heart attack.

2. Methods and Materials:

The data of patients who are suffering from heart attack are collected from "Sevasadan lifeline super specialty, hospital" Sangli, Tal-Miraj, Dist: Sangli. The studies of heart attack patients are carried out over 100 patients among 71 are males and 29 are females. The collection takes place through the patients register with in Hospital. Multiple linear regression was used to predict the heart pulses. The analysis was carried out with the help of SPSS software.

3. Statistical Analysis:

The descriptive statistics such as N, Minimum, Maximum, Mean, Std. deviation for the continuous variable pulse rate, diabetes, high blood pressure

Table 3.1 : Descriptive Statistics

	N	Minimum	Maximum	Mean		Std. Deviation
	Statistic	Statistic	Statistic	Statistic	Std. Error	Statistic
Pulse	100	38	140	80.66	2.034	20.345
Age	100	24	85	63.00	1.148	11.476
Diabetes	100	73	534	179.10	8.835	88.348
HBP	100	70	220	131.99	2.740	27.398
Oxygen level	100	52	100	95.81	.662	6.624

(HBP), and Oxygen level are shown in Table-3.1. For the variable pulse rate, the minimum pulse rate is 38, maximum pulse rate is 140. The mean of pulse rate is 80.66 with standard deviation 20.345

In this study, the dependent variable is pulse rate of patients who are suffering from heart attack and the predictors are gender, age, area of living, oxygen level, high blood pressure, diabetes of patients who are suffering for heart attack. To do multiple linear regression, the basic assumption is that, the dependent variable should be normally distributed. Therefore, we have to check the normality of dependent variable as pulse rate. The null and alternative hypotheses for normality as follows:
H0: Pulse rate of patients follows normal distribution. Vs

H1: Pulse rate of patients does not follow normal distribution.

The Kolmogorov-Smirnov and Shapiro-Wilk tests of normality are given in Table-3.2.

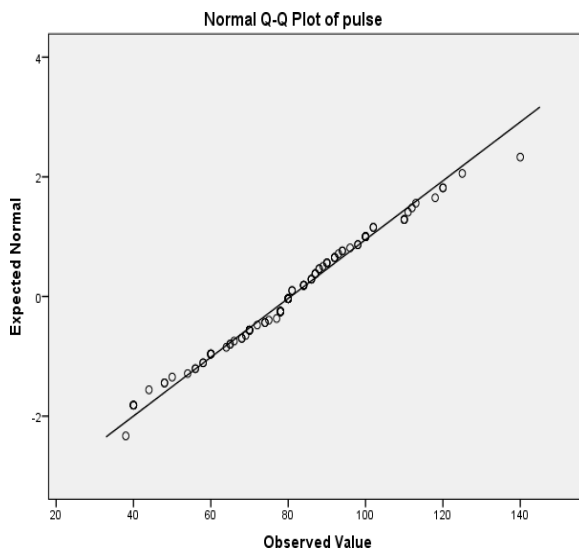
Table 3.2 :Tests of Normality

	Kolmogorov-Smirnov ^a			Shapiro-Wilk		
	Statistic	df	Sig.	Statistic	df	Sig.
Pulse rate	.088	100	.054	.986	100	.359
a. Lilliefors Significance Correction						

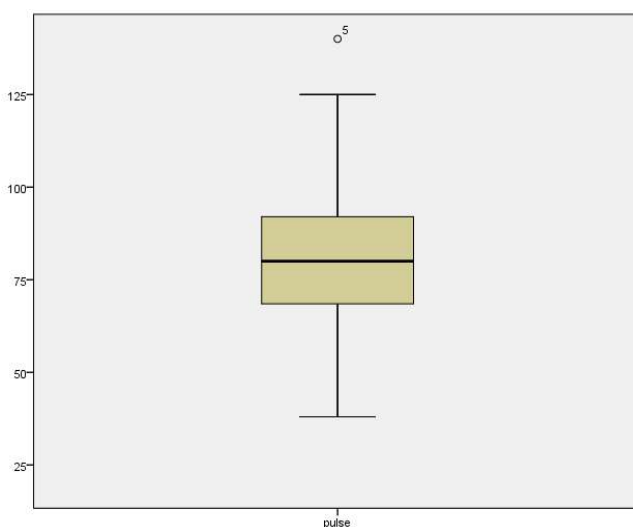
The p- value of Shapiro-Wilk test is greater than 0.05 (level of significance). Hence we fail to reject the null hypothesis and conclude that the pulse rate of patients follows normal distribution.

The Normal Q-Q plot of pulse shows that all quantile points lie on the theoretical straight line. Hence it indicates that the normality assumption

is satisfied.



The Box-Plot shown in below graph shows the five number summary including minimum, first quartile, median, third quartile and maximum. It also displays the outlier if it exists in the data. From the Box-Plot, we can see that the median is in middle of Box and whiskers are about the same on both sides of box. Hence the distribution of pulse rate of patients is Normal (symmetric). It also represent the fifth observation is outlier.



Multiple Linear Regression:

To predict the pulse rate of patients by using the predictors like gender, age,

Table-3.3: Model Summary

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate
1	.531a	.282	.236	17.787
2	.518b	.268	.229	17.863
3	.502c	.252	.220	17.967
a. Predictors: (Constant), diabetes, oxygen level , age, HBP, Area, gender				
b. Predictors: (Constant), diabetes, age, HBP, Area, gender				
c. Predictors: (Constant), diabetes, age, HBP, gender				

area of living, oxygen level, high blood pressure, diabetes of patients who are suffering for heart attack the multiple linear regression is used.

To select final model, the “backward elimination” method is applied. In backward elimination method, we have to set a significance level for deciding when to remove a predictor into the model called as alpha-to remove and it set as $\alpha_R = 0.10$. For this study the backward elimination method builds three models (Table-3.5). In first model, all the predictors are included. The predictor oxygen level has highest p-value (0.181) which is greater than 0.10 is removed from first model, then the new model fitted called as model 2. Now the p-value of predictor area is 0.150 which is greater than 0.10, hence the predictor area is removed from the second model and build new model is called model 3. In model 3, the p-value for all the predictors are less than 0.10. Hence the model 3 is confirmed as final model. The model summary Table -3.3,

gives the value of R, R-square, Adjusted R-square, Std. Error of the Estimate for all three models.

Now we can interpret the results of model 3 because it is final model for this study. The ANOVA Table-3.4 (model 3) indicates that, the p-value of F test 0.000 which is too small. It is indicating that the model fit better. The Coefficient Table-3.5 gives the Unstandardized Coefficients with standard error, value of t test statistic and their respective p-value for each predictor for all three models. The final model for this study is model 3. Therefore, we focus on the results of model 3.

4.Result and discussions:

In model -3, the p-values of the predictors gender, age, HBP and diabetes are less than 0.10 ($\alpha_R = 0.10$). Thus the predictor's gender, age, HBP and diabetes are contributing significantly for predicting the pulse rate of patients who are suffering from heart attack. Thus, the final model for prediction is:

$$\hat{p} \text{ulse} = 64.445 - 7.730 \text{ gender} - 0.434 \text{ age} + 0.315 \text{ HBP} + 0.042 \text{ diabetes}$$

Table-3.4: ANOVA

Model		Sum of Squares	df	Mean Square	F	Sig.
1	Regression	11554.941	6	1925.824	6.087	.000 ^b
	Residual	29421.499	93	316.360		
	Total	40976.440	99			
2	Regression	10981.489	5	2196.298	6.883	.000 ^c
	Residual	29994.951	94	319.095		
	Total	40976.440	99			
3	Regression	10310.153	4	2577.538	7.985	.000 ^d
	Residual	30666.287	95	322.803		
a. Dependent Variable: pulse rate						
b. Predictors: (Constant), diabetics, oxygen level , age, HBP, Area, gender						
c. Predictors: (Constant), diabetics, age, HBP, Area, gender						
d. Predictors: (Constant), diabetics, age, HBP, gender						

Table-3.5: Coefficients

Model		Unstandardized Coefficients		Standardized Coefficients	T	Sig.
		B	Std. Error	Beta		
	(Constant)	105.934	30.321		3.494	.001

1	gender	-7.935	4.297	-.178	-1.847	.068
	Area	-5.703	4.210	-.124	-1.355	.179
	Oxygen level	-.369	.274	-.120	-1.346	.181
	age	-.441	.162	-.249	-2.719	.008
	HBP	.295	.068	.397	4.355	.000
	diabetes	.034	.022	.148	1.564	.121
2	(Constant)	70.766	15.463		4.577	.000
	gender	-7.571	4.307	-.170	-1.758	.082
	Area	-6.116	4.216	-.133	-1.450	.150
	age	-.465	.162	-.262	-2.866	.005
	HBP	.299	.068	.403	4.409	.000
	diabetes	.037	.022	.160	1.690	.094
3	(Constant)	64.445	14.922		4.319	.000
	gender	-7.730	4.330	-.173	-1.785	.077
	age	-.434	.162	-.245	-2.686	.009
	HBP	.315	.067	.424	4.667	.000
	diabetes	.042	.022	.182	1.933	.056
a. Dependent Variable: pulse rate						

Illustration: We want to predict the pulse rate of 55 year old male patients who is suffering from heart attack with high blood pressure and was diabetes 110, 144 respectively.

$$\hat{p}_{ulse} = 64.445 - 7.730(1) - 0.434(55) + 0.315(110) + 0.042(144)$$

$$\hat{p}_{ulse} = 73.543$$

5. Conclusions:

The result of present study shows that the age, gender, high blood pressure, and being diabetes are highly significant risk factors for the patients suffering from heart attack. Doctors can use this model for the prediction of pulse rate based on predictor's gender, age, HBP and diabetes. In future, researcher can use the logistic

regression to predict the chance of heart attack.

References:

1. Hajar R. Risk Factors for Coronary Artery Disease: Historical Perspectives. Heart Views. 2017, Jul-Sep;18(3):109-114.
2. Gupta R, Joshi P, Mohan V, Reddy KS, Yusuf S. Epidemiology and causation of coronary heart disease and stroke in India. Heart. 2008;94:16–26
3. Peter W. F. Wilson, Ralph B. D'Agostino, Daniel Levy, Albert M. Belanger, [Halit Silbershatz](#) and William B. Kannel. Prediction of Coronary Heart Disease Using Risk Factor Categories, AHA journals,

- 1998, Vol. 97, No. 18, 1837-1847.
4. Kannel WB, Gordon T, Schwartz MJ.
Systolic versus diastolic blood pressure
and risk of coronary heart disease. The
Framingham study. *Am J Cardiol.*
1971 Apr; 27(4):335-46.