Study on Ischemic Heart Disease in Southern Punjab, Pakistan

MUHAMMAD KHALID[1], SHAIKH MUHAMMAD ABDULLAH[2], SHEIKH MUHAMMAD AZAM[3], MUHAMMAD IMRAN[4], SAIF-UR-REHMAN[1], MUHAMMAD FAIZAN[5], AHMAD ALI[6], GHULAM MUSTAFA[6], SHOAIB HASSAN[7], ABIR ISHTIAQ[7], JAVED IBAL[7], MUNIR AHMAD[8]

[1]Department of Zoology, Emerson University Multan, Punjab, Pakistan.
[2]Department of Statistics, Institute of Southern Punjab Multan, Punjab, Pakistan.
[3]Department of Zoology, Division of Science and technology, University of Education Lahore, Punjab, Pakistan.
[4]Department of Statistics, Bahuddin Zakariya University Multan, Punjab, Pakistan.
[5]Department of Zoology, University of Agriculture Faisalabad, Punjab, Pakistan.
[6]Department of Zoology, Islamia University of Bahauddin, Punjab, Pakistan
[7]Institute of Pure & Applied Biology Bahauddin Zakariya University, Multan, Pakistan.
[8]Department of Management Sciences, COMSATS Institute of Information technology, Vehari, Punjab, Pakistan.
Correspondence to: Dr. Munir Ahmad, Email: munirahmad@ciitvehari.edu.pk

ABSTRACT

Objective: Study objective is to find out the prevalance and risk factors of ischemic heart disease in Southern Punjab.

Methodology: Data was collected on data fact sheet through direct observations and parameters were noticed as per hospital record. Binary Logistic Regression was applied for statistical analysis of the data. The impact of demographic variables, Hypertension, Diabetes Mellitus and Renal Parameters on Ischemic Heart Disease with the use of logistic regression. Gender, Age, BMI and Smoker were taken as response or dependent variable and Hypertension, Diabetes Mellitus and Renal Parameters were taken as independent variable to determine the Impact of above mentioned demographic variables on "Ischemic Heart Disease".

Results: This study contains patients of various age, gender, smoker, BMI and blood groups. The variable of DM, HTN, Urea and cereal have significant impact on Age. Gender show significant impact with DM. Smoker, BMI and blood group shows significant impacts on all variables.

Conclusion: A strong relation between active and passive smokers, increased in the risk of heart attack was observed. Middle age is associated with lower risk of heart failure. Increased body weight, hypertension, increasing age, diabetes mellitus and smoking are major factors contributing to ischemic heart diseases. While blood group and gender are independent factors ischemic diseases.

Key Words: Binary Logistic Regression, Ischemic Heart Disease, Risk factors.

INTRODUCTION

Ischemic heart disease (IHD) has become a major epidemic in Asian countries and has put a great burden on wellbeing of human and everyday expenditure[1]. Studies conducted in European countries have found that 26.6% of total deaths in these countries are due to IHD[2]. Prevalence of IHD is higher in Asian countries like Pakistan as compared to the European ones[3]. Diabetes, hypertension and renal insufficiency are one of the major risk factors of IHD. Prevalence is also increasing in AS and Europe due to increase the average age and life style changes resulting in obesity and relaxing life styles[4]. Diabetes is characterized by the presence of abnormal blood glucose levels in the blood caused either due to decreased production of insulinor due to conditions that result in insulin resistance[5].

Hypertension (HTN) has affected 1 out of 3 patients in the USA and is also associated with higher morbidity and mortality, about 31% of total world population is suffering from HTN.[4] Prevalence is high in low income nations (32.9%) and low in high incomes nations (28.5%)[6]. The prevalence of HTN is even increasing in premenopausal women during pregnancy. Hypertension is directly associated with ventricular hypertrophy, heart failure and IHD.[7,8]

Chronic Kidney Disease is also one of the major concerning public health problem.[9] Risk is higher among patients having age >60 years. About 30% of total deaths in CKD patients who are on dialysis are due to CHD. CKD also worsens the outcomes of percutaneous coronary intervention and coronary heart surgery. CKD is a major risk factor of failure of PCI in IHD patients[10].

Hypertension, diabetes and CKD are proven risk factors of IHD. The association of these risk factors with IHD in Pakistani population is not widely studied. The main focus of this investigation is to find out the association of diabetes, hypertension and CKD in with IHD.

MATERIAL AND METHOD

Data was collected on data fact sheet through direct observations and parameters were notice as per hospital record as follows: age, gender, diabetes, hypertension, renal parameters, smoking history and BMI.

The statistical model used for analysis of data was Binary Logistic Regression. The impact of demographic variables Hypertension, Diabetes Mellitus and Renal Parameters on Ischemic Heart Disease with the use of logistic regression. Gender, Age, BMI & Smoker were taken as response or dependent variable and Hypertension, Diabetes Mellitus and Renal Parameters were taken as independent variable to determine the Impact of above mentioned demographic variables on "Ischemic Heart Disease".

STATISTICAL MODEL

➤ **First Model:**

Gender (Y) $= \beta_0 + \beta_1$ (Diabetes) $+ \beta_2$ (Hypertension) $+ \beta_3$ (Renal Parameter)

> **Second Model:**

Age (Y) = $\beta_0 + \beta_1$ (Diabetes) + β_2 (Hypertension) + β_3 (Renal Parameter)

> **Third Model:**

BMI (Y) = $\beta_0 + \beta_1$ (Diabetes) + β_2 (Hypertension) + β_3 (Renal Parameter)

> **Fourth Model:**

Smoker (Y) = $\beta_0 + \beta_1$ (Diabetes) + β_2 (Hypertension) + β_3 (Renal Parameter)

NOTATION

Following notation will be used in the above model

Y = Dependents variable

β_0 = Intercept term

$\beta_1 \ldots \beta_3$ = Regression coefficients

Hypertensions, Diabetes, Renal Parameter = Independent Variables.

RESULTS

Table 1.2 shows result which is used to estimate that how efficiently theemodel fits the data. The significance value of the F statistics is small (>0.05) then F the Independent variables it explains the variation to a great extent, in the dependent variable.

Table 1.3 Omnibus tests of model coefficients was applied to see that how much this new model is improved over the chi-square test and to see if there is a significant difference between the Log-Likelihoods of the baseline model and the new model has a significantly reduced 2LL. associated to the baseline then it gives an idea that the new model is discovering more of the variance in the outcome.

The model summary gives the -2LL and pseudo R^2 values for the full model. The -2LL value for this model (470.781) is the -2LL fit the previous null model in the omnibus test of model coefficients which explains that there was a significant decrease in the -2LL. The R^2 values explains approximately how much variation in the outcomes is given. We prefer to use the Negelkerke R^2 which suggested that the model explains 73% of the variation. Notice, how the two version (cox and snell and Nagelkerke) do vary. This just goes to show that these R^2 values are estimations and should not be highlighted.

The model summary of data provides the -2LL and pueudo R^2 values for the full mode. The -2LL value for thisFmodel (470.781) is the -2LL fir the previous nullFmodel in the omnibus test of model coefficients which gives the idea that there was a significant decrease in the -2LL. The R^2 values tell us how much variation in the outcomes is described. We prefer to use the Nagelkerke R^2 (circled) which indicate that theFmodel explains 73% of the variation. Notice how the two versions (cox and snell and Nagelkerke) do vary. This just goes to show that these R^2 values are estimations and should not be highlighted.

(Table 1.2) ANOVA use to check how effectively the model fits the data. The statistic is regression mean square (MSR). The significance value of the statistics is small (smaller then say 0.05) then the independent variables greatly explain the variation in the dependent variable.

ANOVA use to check how well the model fits the data. The F statistic is regression mean square. The significance value of the F statistics is small then the independent

variables greatly explain the variation in the dependent variable.

Table 1.1: Model Summary of Multiple Linear Regression with age

Model	R	R^2	Adjusted R^2	Sd. Error
1	0.323	0.104	0.097	0.683

Table 1.2 Analysis off variance

Model	Sum of Squares	df	Mean Square	f	Significance
Regression	26.751	4	6.688	14.341	0.000
Residual	230.375	494	0.466		
Total	257.126	498			

Table 1.3 Omnibus Test of Model Coefficients

	Chi Square	df	Significance
Step	23.589	4	0.000
Block	23.589	4	0.000
Model	23.589	4	0.000

Table 1.4 Model Summary

Step	-2Log Likelihood	Cox & Snell R^2	Nagelkerke R^2
1	470.781	0.046	0.073

Table 1.5 Estimation of Parameters for smokers

	B	Standard Error	Wald	Df	Significance	Exp (β)
DM	0.440	0.211	4.333	1	0.037	1.552
HTN	-0.627	0.204	9.463	1	0.002	0.534
Urea	0.003	0.006	0.312	1	0.576	1.003
Creat	0.062	0.237	0.068	1	0.794	1.064
Constant	-0.922	0.317	8.448	1	0.004	0.398

Smoker = -.922+.440*DM-.627*HTN+.003*Urea+.062*Creal

Table 1.6 Coefficients

Model	Unstandardized		Standardized	T	Significance
	B	Standard Error	B		
Constant	26.452	1.384		19.118	0.000
DM	2.583	0.991	0.119	2.607	0.009
HTN	1.836	0.971	0.086	1.890	0.059
Urea	-0.033	0.029	-0.52	-1.123	0.262
Creal	-0.113	1.161	-0.005	-0.098	0.922

BMI = 26.452+2.583*DM+1.836*HTN-.033*Urea-.113*Creal

DISSCUSSION

Ischemic heart disease can be reduced by controlling DM that can be valuable for reducing premature death, economic burden of patients, improve life quality and increase work productivity including high cost of medical care[11,12]. Cardiovascular disease is considered as one of the principal causes of death in the world among the patients with diabetes mellitus[13]. DM assists the onset of atherosclerosis and heart failure. Although by using anti-hyperglycemic treatment strategies, cardiovascular complication rates are lessening, yet remain elevated for patients with DM than for those without[14]. Our findings also have similar results related to diabetes, have impact for the onset of heart disease.

According to our results for the relation of smokers with heart disease showed that there is strong relation between active and passive smokers, increases the risk of heart stroke. Further findings showed that the people who smoked for many years have high risk of disease than the

people who never smoked in their history. At some point in life history smoking cessation decrease the risk. Smoking directly contributes for 1 percent of mortality worldwide[15] reported similar findings to our results.

Smokers and body weight relation is complex. While discussing BMI of smokers and nonsmokers generally it is consider that smokers have low BMI than nonsmokers but smoking cessation increases the weight of patients. It is generally reported that smoking cessation leads to increase in 4 to 5 kg of weight in a year[12]. This is a major factor that motivates smokers to continue smoking and they become susceptible to heart disease more quickly. It is also reported that new quitters can gain more weight than the old ones. [11] For the onset of heart disease factors involves are pre health status, age at which smoking start, no of smoking years, cigarettes utilization per day or month.[17,18] Results of different studies depends upon populations, analysis strategies, study quality and participant characteristics. Smoking is coupled with central obesity and augmented oxidative stress and inflammation, and finally leads to heart disease[19].

Considering the high prevalence of smoking worldwide in many countries increases the heart disease at significant rate[20]. Strict steps should be taken to reduce smoking as for the public health. Tobacco should be banned or should be limit to access. Efforts are needed at country and world level through WHO on tobacco control to reduce cigarette consumption among young people specially students and children's under 18 years of age.[21]

Heart disease is a common disease and highly morbid. Depending upon the age and sex heart failure percentage is 20 to 45 % around the world[22] People with heart disease have poor quality of life. Middle age is associated with lower risk of heart failure. Major factors involved in the incident of heart failure are obesity and tobacco use. Obesity also increase total cholesterol that is a damaging factor for heart stroke[23].

Hyperglycemia and Insulin resistance are the metabolic perturbations that be an adjunct to type 2 DM, driving different maladaptive and adaptive response of the cells that escort to definite changes happening in myocardial function and structure known as diabetic cardiomyopathy[24]. Comorbidities are seen commonly in patients with DM, such as dyslipidemia, hypertension, autonomic dysfunction, micro vascular dysfunction and renal impairment may speed up the succession of cardiac dysfunction toward advanced disease at later stage[18].

REFERENCES

1. Hata J, Kiyohara Y. Epidemiology of stroke and coronary artery disease in Asia. Circulation Journal. 2013:CJ-13.
2. Finegold JA, Asaria P, Francis DP. Mortality from ischaemic heart disease by country, region, and age: statistics from World Health Organisation and United Nations. International journal of cardiology. 2013 Sep 30;168(2):934-45.
3. Wang HT, Chen YL, Wu CJ. Impact of chronic kidney disease on clinical outcomes in patients with non-ST elevation myocardial infarction receiving percutaneous coronary intervention—a five-year observational study. International journal of cardiology. 2016 Oct 1;220:166-72.
4. Khalid ZR, Ahmed N, Rizvi FA, Baig MA. ISCHEMIC HEART DISEASE. The Professional Medical Journal. 2016 Sep 10;23(09):1057-9.
5. Markidan J, Cole JW, Merino-Juarez J, Cronin CA, Phipps M, Wozniak M, Kittner SJ, et al. Abstract TMP50: Smoking Increases Risk of Ischemic Stroke in Young Men. Stroke. 2018 Jan 22;49(Suppl_1):ATMP50-.
6. Fitchett D, Zinman B, Wanner C, Lachin JM, Hantel S, Salsali A, Johansen OE, Woerle HJ, Broedl UC, Inzucchi SE, et al. Heart failure outcomes with empagliflozin in patients with type 2 diabetes at high cardiovascular risk: results of the EMPA-REG OUTCOME® trial. European heart journal. 2016 May 14;37(19):1526-34.
7. Zannad F, Cannon CP, Cushman WC, Bakris GL, Menon V, Perez AT, Fleck PR, Mehta CR, Kupfer S, Wilson C, Lam H, et al. Heart failure and mortality outcomes in patients with type 2 diabetes taking alogliptin versus placebo in EXAMINE: a multicentre, randomised, double-blind trial. The Lancet. 2015 May 23;385(9982):2067-76.
8. Inampudi C, Ahmed AA, Khosla R, Morgan CJ, Deedwania P, Blackman M, Butler J, Fonarow GC, White M, Fletcher RD, Aronow WS, et al. Current Smoking and a "Non-Paradoxical" Association with Mortality among Community-Dwelling Older Heart Failure Patients: Findings From the Cardiovascular Health Study. Journal of Cardiac Failure. 2016 Aug 1;22(8):S89.
9. Joyce E, Lala A, Stevens SR, Cooper LB, AbouEzzeddine OF, Groarke JD, Grodin JL, Braunwald E, Anstrom KJ, Redfield MM, Stevenson LW, et al. Prevalence, profile, and prognosis of severe obesity in contemporary hospitalized heart failure trial populations. JACC: Heart Failure. 2016 Dec;4(12):923-31.
10. Sharma A, Lavie CJ, Borer JS, Vallakati A, Goel S, Lopez-Jimenez F, Arbab-Zadeh A, Mukherjee D, Lazar JM, et al. Meta-analysis of the relation of body mass index to all-cause and cardiovascular mortality and hospitalization in patients with chronic heart failure. The American journal of cardiology. 2015 May 15;115(10):1428-34.
11. Ahmad FS, Ning H, Rich JD, Yancy CW, Lloyd-Jones DM, Wilkins JT, et al. Hypertension, obesity, diabetes, and heart failure–free survival: the Cardiovascular Disease Lifetime Risk Pooling Project. JACC: Heart Failure. 2016 Dec; 4(12):911-9.
12. Del Gobbo LC, Kalantarian S, Imamura F, Lemaitre R, Siscovick DS, Psaty BM, Mozaffarian D, et al. Contribution of major lifestyle risk factors for incident heart failure in older adults: the Cardiovascular Health Study. JACC: Heart Failure. 2015 Jul;3(7):520-8.
13. CrespoLeiro MG, Anker SD, Maggioni AP, Coats AJ, Filippatos G, Ruschitzka F, Ferrari R, Piepoli MF, Delgado Jimenez JF, Metra M, Fonseca C, et al. European Society of Cardiology Heart Failure Long-Term Registry (ESC-HF-LT): 1-year follow-up outcomes and differences across regions. European journal of heart failure. 2016 Jun; 18(6):613-25.
14. Carter BD, Abnet CC, Feskanich D, Freedman ND, Hartge P, Lewis CE, Ockene JK, Prentice RL, Speizer FE, Thun MJ, Jacobs EJ, et al. Smoking and mortality—beyond established causes. New England journal of medicine. 2015 Feb 12; 372(7):631-40.
15. Dei Cas A, Khan SS, Butler J, Mentz RJ, Bonow RO, Avogaro A, Tschoepe D, Doehner W, Greene SJ, Senni M, Gheorghiade M, et al. Impact of diabetes on epidemiology, treatment, and outcomes of patients with heart failure. JACC: Heart Failure. 2015 Feb;3(2):136-45.
16. Gilbert RE, Krum H. Heart failure in diabetes: effects of anti-hyperglycaemic drug therapy. The Lancet. 2015 May 23;385(9982):2107-17.
17. Weir DL, McAlister FA, Senthilselvan A, Minhas-Sandhu JK, Eurich DT, et al. Sitagliptin use in patients with diabetes and heart failure: a population-based retrospective cohort study. JACC: Heart Failure. 2014 Dec;2(6):573-82.