Comparison of Diabetics and Non-Diabetics Patients with St-Segment Elevation Myocardial Infarction

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Abstract-It is not clear if people with diabetes but no heart attack in the past have the same chance of getting heart disease as non-diabetic individuals who did have a heart attack. Our research focused on examining the probability of developing heart disease and stroke, as well as evaluating the likelihood of mortality resulting from heart disease, among individuals with and without diabetes who had previously experienced a heart attack. The main aim of the study is to understand and examine ST-segment elevation myocardial infarction (STEMI) in people with diabetes and those without diabetes and to compare indications of STEMI in patients with and without diabetes. Additionally, 160 people with diabetes, as well as non-diabetic patients, were studied using the methods utilized in this study. The research was done over the course of 18 months by investigating the various tests such as electrocardiogram, cardiac markers, blood-sugar level and glycosylated haemoglobin (HbA1c). Results of this study involved 160 individuals, 80 of whom were non-diabetes and 80 of whom were diabetics. There were 101 men and 59 females among the 160 patients that participated in this study. Conclusion is that the Non-diabetic individuals who had a MI history had a greater risk of CHD events and cardiovascular death in comparison to diabetic individuals without a history of heart attack (MI). However, both groups had a similar risk of stroke.

Keywords—Coronary angiography, Acute coronary syndrome, Myocardial infarction, Coronary heart disease, Glycosylated haemoglobin.

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INTRODUCTION

Various issues that impact the functioning and structure of the heart collectively fall under the term heart disease[1]. Coronary heart disease is a condition where the heart doesn't get enough oxygen-rich blood because its arteries are blocked. The United States experiences the highest number of deaths primarily due to the leading role of CHD as a cause of death.. The global count of adults affected with coronary artery disease, as stated by the Centres for Disease Control and Prevention, stands at approximately 18 million[2]. This means that it is the most often seen kind of heart disease in the country. The improper functioning of the major blood vessels located outside the heart results in coronary artery disease. The heart condition known as coronary microvascular disease targets specifically the diminutive blood vessels in the heart muscle. Women are more prone to getting a heart condition called coronary microvascular disease.

Acute coronary syndrome (ACS)[2] is a range of different symptoms that affect the heart. It includes serious heart attacks (STEMI) as well as less severe heart attacks (NSTEMI) or unstable angina. ACS is a disease that can be caused by many factors. Some of these factors include getting older, being male, smoking, a family history of heart disease, having diabetes, high blood pressure as well as low physical activity[3].In order to be successful, the blockage in the outer heart channel needs to be cleared and the flow of blood through tiny blood vessels is important for the outcome. ST segment changes indicate issues with blood flow to the heart muscle rather than the outer layer of the heart, which can provide important information about the future outlook of a patient's condition that may not be seen with just a coronary angiography[4]. The objective of this investigation is to measure the effectiveness of thrombolysis treatment by examining the resolution of the ST segment as well as the outcomes in

individuals diagnosed with diabetes and those without diabetes who had experienced a type of heart attack referred to as STEMI.

LITERATURE REVIEW

Diabetes patients are particularly vulnerable to coronary artery disease (CAD). At the onset, it was asserted that the probability of having a heart attack for those with diabetes was akin to individuals without diabetes who had previously experienced a cardiac event. While individuals with diabetes still face a greater chance of suffering from a heart attack or MI, new research suggests that the extent to which diabetes affects the probability of developing heart disease (CAD) in the future is not as significant as previously assumed[3]. A proper risk assessment of diabetic patients is crucial from a clinical and financial standpoint. According to current recommendations, patients with diabetes along with one or more ischemic risk factors for coronary artery disease, such as gender, an advanced age, a family record of elevated blood pressure, premature CVD, and hyper-cholesterolemia, should receive preventive therapy (aspirin, statins, as well as antihypertensive treatments) to lower the risk of MI.

Diabetes mellitus (DM)[5] is a health condition that affects how your body processes sugar in your blood, causing it to become too high. DM has different types of orders, such as Type-1, Type-2, neonatal diabetes, maturity-onset diabetes of the youthful (MODY), and secondary causes due to hormone problems, gravid diabetes, steroid use, and so on. Diabetes Type-1 and Type-2 are the two primary types of diabetes. Type-1 diabetes occurs due to an impairment in storing insulin, while Type-2 diabetes arises from a malfunction in utilizing insulin[6]. T1DM primarily impacts children or adolescents, whereas T2DM can develop in adults who are in their middle-aged or elderly years and have elevated blood sugar due to a poor lifestyle and dietary habits.

The causes and development of Type-1 and Type-2 diabetes are very different, so each type has its own unique causes, symptoms, and treatments. Patients with diabetes have a higher chance of having a heart attack called myocardial infarction compared to those without diabetes. Doctors recommend taking preventive measures for patients who have diabetes and are at risk of developing ischaemic heart disease due to decreased blood flow. The objective of their study was to assess the likelihood of heart problems occurring in patients with both diabetes as well as heart disease subsequent to a coronary angiography (CAG) procedure.

Researchers in study[6] looked at the chances of having a heart attack and dying within 10 years for people without blockages in their heart arteries compared to the general population. CAG was conducted on every participant of the study, taking place in Western Denmark from 2003 to 2016. They didn't have any problems with their heart arteries. Matched were patients in Western Denmark who have never experienced CAD or heart attack with individuals of the same gender and age. The results were injury and death. They used a method called ten-year risk differences to estimate how many people were affected by a certain condition over time. They also considered the possibility of death due to other causes while looking at the occurrence of heart attacks. The calculation of incidence rate ratios (aIRRs), adjusted and unadjusted, was performed through the application of conditional Poisson regression. The research incorporated a comprehensive pool of participants, comprising 46,467 patients as well as 234,654 individuals from the normal control, resulting in a total of 280,121 subjects. The average length of time that was observed in the study was 7.7 years. Over a 10-year period, the rate of heart attacks (MI) was 2. 40% in patients without blockages in their heart arteries, and 2.70% in the normal control. There was no noticeable variation in risk between the two groups ~30%, meaning the patients without blockages had a slightly lower risk. The adjusted incidence rate ratio (aIRR) was 0. There was a significant contrast in risk among the normal population and patients without blockages, with the latter experiencing a 70-point decrease.

Acute myocardial infarction (AMI)[7] is when the heart muscle dies from a blocked blood vessel. To determine the illness, doctors use a test called electrocardiography and check if there are specific substances in the blood. The treatment involves using medicines that prevent blood clots, slow heart rate, relax blood vessels, lower cholesterol, and improve blood flow. For a heart attack such as STEMI, emergency treatment involves using medicines that dissolve blood clots (called fibrinolytic drugs), inserting a small tube into a blood vessel (percutaneous intervention), or sometimes performing a surgery to bypass blocked coronary arteries (bypass graft surgery)[8]. Additionally, for a specific kind of heart attack called non-segment elevation myocardial infarction (NEMI), there are two ways to treat it: either by a procedure called percutaneous intervention or by open-heart surgery called coronary artery bypass graft surgery.

STEMI is a type of heart attack that happens when the heart doesn't get enough blood for a long time, which affects a big part of it. STEMI is a serious condition that can lead to death or disability. It requires a fast response[9]. There are five types of heart attacks called: 1. Spontaneous heart attack 2. Heart attack caused by a problem with blood flow 3. Fatal heart attack when test results are not available 4. Heart attack related to a specific heart procedure called Percutaneous Coronary Intervention 5. Heart attack related to another heart procedure called Coronary Artery Bypass Grafting[10].

MATERIAL AND METHODS

The study spanned a duration of one and a half years, commencing in October 2018 and concluding in March 2020. The sample size was calculated on the basis of the given formula: $n = \frac{(Z\alpha+Z\beta)^2(p1q1+q1q2)}{(p1-p2)^2}$ where,

p1 = 180 out of 186 non-diabetics = 96.77%,
q2 = 100 – p2 = 16.35%.
Zβ = 0.842 Type II error,
q1 = 100 – p1 = 3.23%,
Zα = 1.96 @ 5% level of significance- Type I error,
p2 = 174 out of 208 diabetics = 83.65% and
$n = \frac{(1.96 + 0.842)^2\,[(96.77 \times 3.23) + (83.65 \times 16.35)]}{(83.65-96.77)^2}$ where, n = 76.64 and for better yield = 80 patients per group

STATISTICAL ANALYSES

With the exception of MI, follow-up started 30 days after CAG as well as persisted until mortality, migration, or 7 years following the start of the index treatment, whichever happened first. Follow-up started on the day of hospital release following CAG. During the follow-up period, information on cardiac fatalities, all MIs, as well as all-cause deaths was collected. On the basis of the cumulative rates of cardiac mortality, all-cause death, including MI that occurred in each patient segment groups over the follow-up period, average incidence curves were built. We opted for estimating rate ratios (RRs) since follow-up duration might vary.

OBSERVATION AND RESULTS

TABLE I. DISTRIBUTION OF GENDER BETWEEN NON- DIABETIC AND DIABETIC CASES

Sex	**Diabetic (n=80)**		**Non-Diabetic (n=80)**		
	n	***%***	***n***	***%***	
Male	53	66.3	48	60	χ2=0.671 DF=1 p=0.413
Female	27	33.7	32	40	
Total	80	100	80	100	

In the given table, there are 160 patients in which 60% male and 40% female are non-diabetic, on the other side 66.3% male and 33.7% female are diabetic patients. The p value is equals to 0.413.

TABLE II. DISTRIBUTION ACCORDING TO AGE OF PATIENTS

Age (years)	**Diabetic (n=80)**		**Non-Diabetic (n=80)**		
	n	***%***	***n***	***%***	
30-39	4	5.0	4	5.0	
40-49	10	12.5	9	11.3	χ2=1.7 DF=4 p=0.780
50-59	18	22.5	13	16.3	
60-69	31	38.8	31	38.8	
≥ 70	17	21.3	23	28.8	
Total	80	100.0	80	100.0	

In the table shown above, the average age for people without diabetes was 61.4+12.1 years, while for those with diabetes it was 59.6+10.4years.

TABLE III. COMPARISON OF FAILED ST SEGMENTS IN ECG AMONG NON-DIABETIC AND DIABETICS.

ST Resolution	**Diabetic (n=80)**	**Non-Diabetic (n=80)**	

	N	***%***	***N***	***%***	
Failed	32	40	13	16.25	χ2=11.16 DF=1 p=0.00083*
Complete/Partial	48	60	67	83.75	
Total	80	100	80	100	
*Significant at 5% level of significance(p<0.05)					

There was a significant disparity in the ability to measure the 'ST' Segment after thrombolysis, with diabetic individuals experiencing notably poorer results compared to their non-diabetic counterparts.

TABLE IV. COLLATION OF COMPLETE ST SEGMENT RESOLUTION IN ECG AMONG NON-DIABETIC AND DIABETICS

ST Resolution	**Non-diabetic (n=80)**		**Diabetic (n=80)**		
	N	***%***	***N***	***%***	
Complete	25	45.45	24	30	χ2=0.0294 DF=1 p=0.86
Failed/Partial	55	54.55	56	70	
Total	80	100	80	100	

Following thrombolysis, complete 'ST' segment remission was observed in 25 (45.45%) non-diabetic individuals as well as 24 (30%) diabetic patients.

TABLE V. COMPARISON OF PARTIAL ST SEGMENT RESOLUTION IN ECG BETWEEN NON-DIABETICS AND DIABETICS

ST Resolution	**Diabetic (n=80)**		**Non-diabetic (n=80)**		
					χ2=8.3559 DF=1 p=0.003844*
	N	***%***	***N***	***%***	
Complete	24	30	42	52.5	
Failed/Partial	56	70	38	47.5	
Total	80	100	80	100	

Following thrombolysis, partial 'ST' segment resolution was observed in 42 (45.45%) non-diabetic individuals as well as 24 (30%) diabetic subjects; the percentage in the non-diabetic group was substantially greater.

TABLE VI. COMPARISON OF OUTCOME AMONG NON-DIABETIC AND DIABETIC PATIENTS

ST Resolution	**Diabetic (n=80)**		**Non-diabetic (n=80)**		
	N	***%***	***n***	***%***	
Discharge	75	93.8	77	96.3	χ2=0.526 DF=1 p=0.468
Death	5	6.3	3	3.8	
Total	80	100	80	100	

Out of 80 non-diabetic patients in this study 77(96.3%) patients were discharged and death occurred in 3(3.8%) patients whereas in diabetic group 75(93.8%) patients were discharged and death occurred in 5(6.3%) patients.

DISCUSSION

Compared to individuals without diabetes, men with diabetes have a twofold increased risk of CAD, while postmenopausal women with diabetes have a fourfold increased risk. It means that it starts earlier than what is usually expected. In people with

diabetes, there are more cases of blood vessel problems compared to people without diabetes. This is because there are more thick pillars blocking blood flow in diabetics. We can determine how well a fibrinolytic treatment worked for a heart attack by looking at the changes in the ST segment on an ECG 90 minutes after giving the treatment.

In terms of age distribution, the largest portion of participants in this study (38.8 cases) belonged to the 60-69 age group, while a smaller proportion consisted of individuals aged 70 and above (25 cases). In non-diabetic cases maximum number of cases were seen in 60-69 (38.8) times age group followed by> 70 times (28.8). In diabetic cases maximum cases observed in 60-69 (38.8) times age group followed by 50-59 (22.5). Mean age in nondiabetic group was 61.412.1 times and in diabetic group it was 59.610.4 times.Out of 80 diabetic cases enrolled in the study, 24 (30) case had complete resolution of ST- Segment, 24 (30) had partial resolution and 32 (40) cases had failed resolution whereas in non-diabetic group 25 (31.3) cases had complete, 42 (52.5) had partial and 13 (16.3) had failed resolution. As observed in present study failed resolution is more in diabetic group ($p = 0.002$).Out of 80 non-diabetic cases in this study 77 (96.3) cases were discharged and in diabetic group 75 (93.8) cases were discharged; whereas death passed in 3(3.8) cases in non-diabetic group and 5 (6.3) cases in diabetic group, with no statistical difference ($p = 0.468$).

CONCLUSION

According to the research, Individuals with diabetes who experience a specific type of heart attack known as STEMI have a higher probability of receiving ineffective thrombolysis treatment in comparison to non-diabetic individuals with the same type of heart attack. In this study, it was found that more people have had a heart attack in the front wall of their heart, and this occurred more commonly. In this study, it was noticed that more successful clot removal occurred in people who were not diabetic. There was not a noticeable difference in growth between the two different clotting agents used. Our study indicated that, post-treatment for blood clot dissolution, there was an absence of any substantial variance in the expulsion rate of blood from the left ventricle of the heart when comparing diabetic and non-diabetic groups. Patients with diabetes were found to have higher levels of hypertriglyceridemia compared to patients without diabetes. In this study, we found that people with diabetes stayed at the sanatorium for a longer time than those without diabetes. We found that using thrombolytics right away led to worse outcomes for people with diabetes compared to those without diabetes, including higher rates of death and illness.

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