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Correlation Between Risk Factors and Glycemic Status in Diabetes

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Abstract: ***Objective: This study aims to assess the association of Risk Factors and Glycemic status in Type 2 Diabetes Mellitus (T2DM). The research focuses on understanding the potential role of risk factors on Glycemic status in T2DM patients. Methods: A cross - sectional study was conducted on individuals diagnosed with T2DM. Participants were categorized into separate groups based on the HbA1C levels (<7, 7 - 9, >9) respectively and risk factors, including, age, sex, duration of diabetes, smoking, hypertension and body mass index. The chi - square test was employed to examine any correlation for Statistical analyses. Results: Preliminary findings suggest statistical significance between hypertension and HbA1C within individuals with T2DM. The data also indicate there is potential link between risk factors and HbA1C in T2DM. Conclusion: This study underscores the significance of evaluating A possible effect of HbA1C on risk factors in T2DM patients. To clarify the underlying mechanisms and investigate if therapies aimed at lowering HbA1C helps in lowering risk factors, more study is required on topic. The outcomes of this investigation may contribute valuable insights for the development of preventive strategies and personalized management approaches in individuals with T2DM.***

Keywords: Type 2 Diabetes, Risk Factors, HbA1C

1. Introduction

1.1 Background

More than 62 million Indians have been diagnosed with diabetes mellitus (DM), and the condition is quickly beginning to take the form of a possible epidemic.[1, 2] Globally, the number of people with DM is expected to rise from 382 million (8.3%) in 2013 to 592 million (10.1%) in 2035. This rise corresponds with the rising incidence of obesity.463 million individuals worldwide, ages 20 to 79, suffer with DM. In India, the number of cases is expected to double from 171 million to 366 million between 2000 and 2030. India may have 79.4 million cases overall, far more than China (42.3 million) and the United States (30.3 million).[3, 4] The disease's etiology has always been complex, involving both hereditary and environmental variables. These environmental factors include obesity, growing living standards, consistent urban migration, and changes in lifestyle.

Up to 5% more people die from cardiovascular and general causes when they have type 2 diabetes. Before the age of 70, individuals diagnosed with type 2 diabetes mellitus (T2DM) had 70% of the life expectancy of non - diabetics. According to epidemiological research, T2DM does not raise the risk of cardiovascular morbidity and mortality due to traditional cardiovascular risk factors like smoking, high blood pressure, and hypercholesterolemia. Instead, the illness itself is connected to the excess morbidity and mortality.[5]

Reducing morbidity and death greatly depends on early sickness detection and treatment. While the general population has seen an increase in the diagnosis of DM due to new diagnostic criteria based on a fasting plasma glucose (FPG) of 126 mg/dl (7.8 mmol/l), some reports indicate that individuals with DM who were previously diagnosed by 2 - hour oral glucose tolerance test (OGTT) glucose measurements of more than 11.1 mmol/l (200 mg/dl) 3 would not have been diagnosed due to this FPG criterion. Thus, it calls for better ways to identify DM in people who are at high risk.[6]

Chronic hyperglycemia and dyslipidemia of diabetes are associated with long - term damage, dysfunction, and failure of various organs, especially the eyes, kidneys, nerves, heart, and blood vessels2. Secondary dyslipidemia occurs due to hypothyroidism, obstructive liver disease, obesity, diabetes mellitus, pregnancy, chronic renal failure, alcohol, cigarettes, smoking, bypass surgery, and stress.3Diabetic dyslipidemia is a condition where the good cholesterol (HDL) levels are decreased and raise triglyceride and bad cholesterol (LDL), which raise the chance of developing heart disease and stroke[7].

The 4 primary risk variables for CVD are hypercholesterolemia, hypertension, DM & cigarette smoking. Insulin resistance state is associated with DM and metabolic syndrome (MS). The 4 major features of metabolic syndrome are hyperinsulinemia, hypertension, hyperlipidemia, and hyperglycemia. Each of these features has been demonstrated to be an independent risk factor for coronary artery disease (CAD) and capable of working together synergistically to accelerate both non - diabetic atherosclerosis and Atherosclerosis associated with MS and T2DM.[8]

2. Objectives

To assess the association of Risk Factors and Glycemic status in Type 2 Diabetes Mellitus (T2DM).

Inclusion Criteria:

- Patients are already on treatment Regarding T2DM.
- Newly detected individuals with T2DM.

- Both genders were included.

Exclusion Criteria:
Patients with
- Patients with age below 40 years
- Patients taking anti - lipidemic drugs
- Those having past history of consumption of alcohol
- Patients with H/O ischemic heart disease and stroke / Chronic Renal Disease / Liver Cirrhosis / Cancer
- Those who have History of Thyroid Disorder / Bronchial Asthma / Tuberculosis

Sample: A total of 150 patients participated in this cross - sectional study conducted in Tumkur district.

3. Results

Table 1: Distribution of the study group according to age

Age (in years)	Frequency	Percentage
41- 50	50	33.3
51- 60	46	30.7
61- 70	33	22.0
> 70	21	14.0
Total	150	100.0

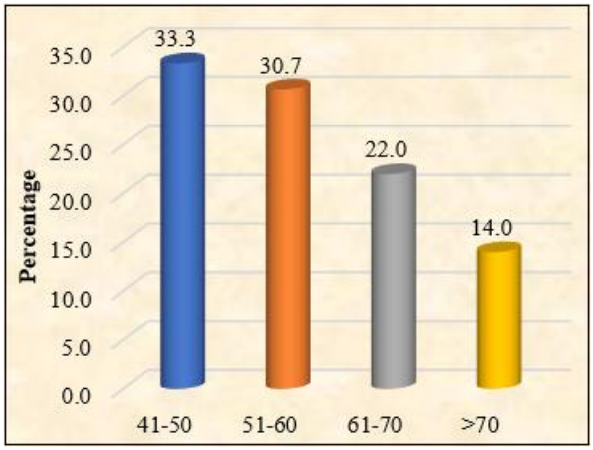

Chart 1: Distribution of the study group according to age

The age was 41 – 50 years in 33.3%, 51 – 60 years in 30.7% and 61 – 70 years in 22.0% of the cases.

Table 2: Distribution of study group according to Sex

Sex	Frequency	Percentage
Male	83	53.3
Female	67	44.7
Total	150	100.0

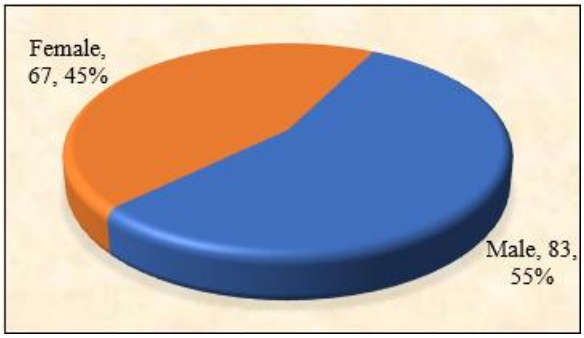

Chart 2: Distribution of the study group according to Sex

In this study 55.0% were males and 45% were females.

Table 3: Distribution of the study group according to Duration of diabetes

Duration of Diabetes Mellitus	Frequency	Percentage
Less than 1 year	21	14.1
1- 5 years	66	44.0
5- 10 years	42	28.0
More than 10 years	21	14.0
Total	150	100.0

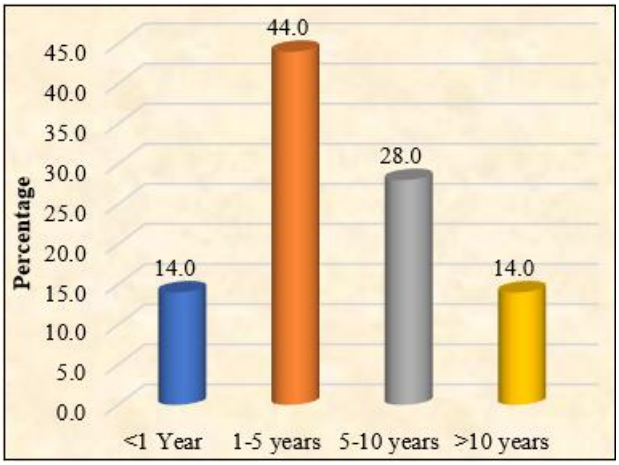

Chart 3: Distribution of the study group according to Duration of diabetes

About 44.0% of the cases had duration of 1 – 5 years of DM.

Table 4: Distribution of the study group according to comorbidities

Comorbidities	Frequency	Percentage
Smoking	12	8.0
HTN	45	30.0

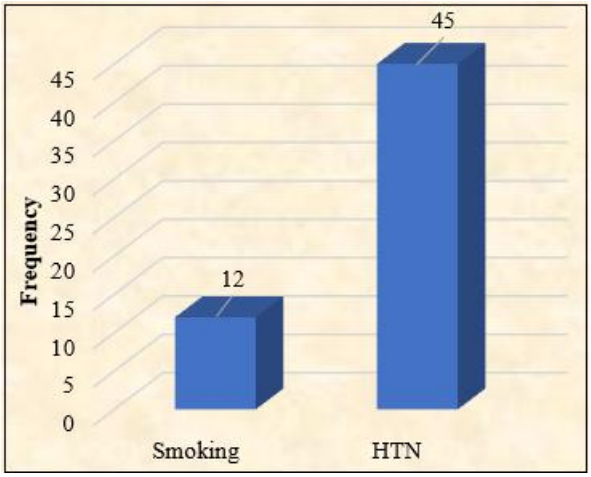

Chart 4: Distribution of the study group according to comorbidities

About 8.0% were smoking and 30.0% were hypertensives.

Table 5: Distribution of the study group according to treatment

Rx	Frequency	Percentage
OHA	73	48.7
Insulin	37	24.7
OHA + Insulin	40	26.7
Total	150	100.0

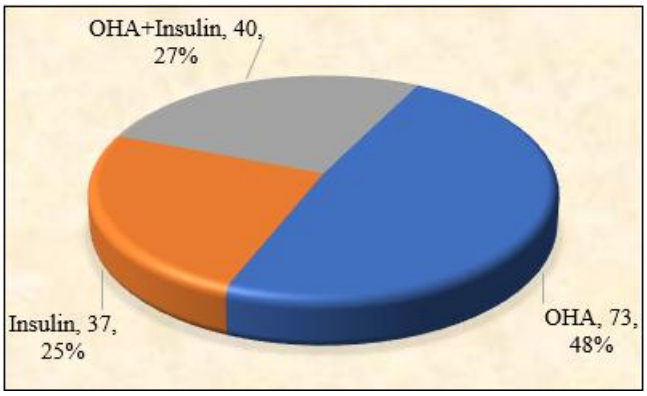

Chart 5: Distribution of the study group according to treatment

About 48.7% were on OHA, 24.7% were on insulin and 26.7% were on OHA and Insulin.

Table 6: Association of the study group according to age and HbA1c levels

Age (in years)	HbA1C			Total	Chi Square, P- Value
	<7	7- 9	> 9		
41- 50	20 (40.0%)	11 (22.0%)	19 (38.0%)	50 (100.0%)	6.978, 0.323
51- 60	18 (39.1%)	6(13.0%)	22 (47.8%)	46 (100.0%)	
61- 70	11 (33.3%)	11 (33.3%)	11 (33.3%)	33 (100.0%)	
> 70	9 (42.9%)	2 (9.5%)	10 (47.6%)	21 (100.0%)	
Total	58 (38.7%)	30 (20.0%)	62 (41.3%)	150 (100.0%)	

About 40.0% of cases with HbA1c level of less than 7 % were between the ages of 41 – 50 years. Majority of cases aged 51 years and above had HbA1c level of more than 9 %. There was no statistically significant difference.

Table 7: Association of the study group according to Sex and HbA1c levels

Sex	HbA1C			Total	Chi Square, P- Value
	<7	7- 9	> 9		
Male	35 (40.2%)	17 (22.5%)	31 (37.3%)	83 (100.0%)	1.324, 0.516
Female	23 (34.3%)	13 (19.4%)	31 (46.3%)	67 (100.0%)	
Total	58 (38.7%)	30 (20.0%)	62 (41.3%)	150 (100.0%)	

About 42.2% of cases with HbA1c of less than 7 were males and more than 9% were females. There was no statistically significant difference.

Table 8: Association of the study group according to Duration of diabetes and HbA1c levels

Duration of Diabetes	HbA1C			Total	Chi Square, P- Value
	<7	7- 9	> 9		
< 1 year	11 (52.40%)	5 (23.8%)	5 (23.8%)	21 (100.0%)	6.978, 0.323
1- 5 years	29 (43.9%)	13 (19.7%)	24 (36.4%)	66 (100.0%)	
5- 10 years	14 (33.3%)	7 (16.7%)	21 (50.0%)	42 (100.0%)	
>10 years	4 (19.0%)	5 (23.8%)	12 (57.1%)	21 (100.0%)	
Total	58 (38.7%)	30 (20.0%)	62 (41.3%)	150 (100.0%)	

Most of cases with HbA1c of less than 7% had duration of less than 5 years and most of cases with more than 5 years of duration had HbA1c of more than 9%. There was no statistically significant difference.

Table 9: Association of the study group according to Smoking and HbA1c levels

Smoking	HbA1C			Total	Chi Square, P- Value
	<7	7- 9	> 9		
Yes	5 (41.7%)	2 (16.7%)	5 (41.7%)	12 (100.0%)	0.103, 0.950
No	53 (38.4%)	28 (20.3%)	57 (41.3%)	138 (100.0%)	
Total	58 (38.7%)	30 (20.0%)	62 (41.3%)	150 (100.0%)	

About 41.7% of the cases with habit of smoking had HbA1c of more than 9%. There was no statistically significant difference.

Table 10: Association of the study group according to hypertension and HbA1c levels

HTN	HbA1C			Total	Chi Square, P- Value
	<7	7- 9	> 9		
Yes	25 (55.6%)	6 (13.3%)	14 (31.1%)	45 (100.0%)	7.796, 0.020
No	33 (31.4%)	24 (22.9%)	48 (45.7%)	105 (100.0%)	
Total	58 (38.7%)	30 (20.0%)	62 (41.3%)	150 (100.0%)	

About 55.6% cases with HbA1c of less than 7% and 45.7% cases with HbA1c of more than 9% were HTN. There was statistically significant difference.

Table 11: Association of the study group according to BMI class and HbA1c levels

BMI Class	HbA1C			Total	Chi Square, P- Value
	<7	7- 9	> 9		
< 18.5	3 (60.0%)	1 (20.0%)	1 (20.0%)	5 (100.0%)	13.776, 0.088
18.5- 22.9	8 (29.6%)	2 (7.4%)	17 (63.0%)	27 (100.0%)	
23- 24.9	8 (42.1%)	7 (36.8%)	4 (21.1%)	19 (100.0%)	
25- 29.9	34 (43.0%)	15 (19.0%)	30 (38.0%)	79 (100.0%)	
>= 30	5 (25.0%)	5 (25.0%)	10 (50.0%)	20 (100%)	
Total	58 (38.7%)	30 (20.0%)	62 (41.3%)	150 (100.0%)	

Most of cases with BMI of 18.5 – 22.9 had HbA1c less then 7, more ≥ 30 had HbA1c of more than 9%. There was no statistically significant difference.

4. Discussion

One feature of our study is the correlation that we found between risk factors and HbA1C levels in those who have type 2 diabetes, offering insights into the complex interplay link problems with the risk factors and disorders of metabolism. Although no significant relationship was found between risk factors and HbA1C, only Patients with Hypertension has significant negative connection.

In 33.3% cases, the age range was 41–50 years, in 30.7% it was 51–60 years, and in 22.0% cases, it was 61–70 years.
55.0% cases in this study were male, and 45% were female.
1 to 5 years was the duration of DM in about 44.0% cases.
About 8.0% cases had smoking, whereas 30% cases had hypertension.

HbA1C and Age - Our study demonstrated the age range of 41 to 50 years was represented by about 40.0% cases with a HbA1c level of less than 7%. In Contrast, 49±9.8 was the average age of patient with HbA1c less then 7%.9 There was no statistical significance relation.
HbA1C and Sex - In our study, Males made up about 42.2% cases with a HbA1c of less than 7, while females made up ≥ 9%. In one study, variations in HbA1C values HbA1C levels was statistically significant between males and females.1^0. In contrast, more then 50% of the female had HbA1c less than 7 in Naqvi et al.9 There was no statistical significance relation between HbA1C and sex.

HbA1C and Duration of diabetes - Most of cases with HbA1c of less than 7% had duration of less than 5 years and most of cases with more than 5 years of duration had HbA1c of more than 9%. There was no statistical significance relation between HbA1C and Duration of diabetes in our study.

HbA1C and Smoking - More than 7% was the HbA1C in about 58.4% of the instances where smoking was a habit. In research, 67% cases had HbA1c more than 7 %.9. There was no statistical significance relation between HbA1C and smoking.

HbA1C and Hypertension - HTN made up about 55.6% of the cases with a HbA1c of less than 7% and 45.7% with HbA1C more than 9%. In research, 38% cases had HbA1C less than 7%.9. There was inverse relationship relation between HbA1C and hypertension which was statistical significance.

HbA1C and BMI - Most people with a BMI between 18.5 and 22.9 had a HbA1c of less than 7, whereas those with a BMI ≥ 30 had a HbA1c of ≥ 9%. There was no statistical significance relation between HbA1C and BMI.

Clinical Implications: There are important clinical ramifications for the connections between HbA1C and risk factors linked to type 2 DM. Identification of the risk factors during regular clinical evaluations may help identify diabetics who are more likely to develop macrovascular and microvascular problems. This may lead to the creation of tailored treatment regimens and early intervention techniques that address both diabetes control.

Early Intervention: Early intervention could lower the chance of cardiovascular problems and enhance overall results. This includes pharmacological therapies to lower HbA1C levels and lifestyle adjustments.

Screening Programs: The study backs up the inclusion of patient with risk factor for more comprehensive screening programs for people with T2DM or individuals who have received a diagnosis of the illness. Identifying those who are more likely to experience cardiovascular disease should be included in routine screens. This would help with early intervention and prevention efforts.

Treatment Strategies: Physicians could investigate how therapies aimed at HbA1C levels affect macrovascular and microvascular consequences for people with type 2 DM. It might be feasible to reduce the chance of cardiovascular incidents in this population by looking into pharmaceuticals or lifestyle changes that successfully lower HbA1C.

Patient Education: Enhanced cognizance of the correlation among HbA1C, diabetes, and cardiovascular hazards can enable those who have type 2 DM to take an active role in their treatment. It can be even more important to educate patients on lifestyle changes, such as eating better and quitting smoking.

Follow - up Monitoring: Long - term management strategies should include routine Hba1C level monitoring in T2DM patients. With this method, we could monitor changes in HbA1C levels over time and modify our treatment plans, accordingly, helping to maintain risk reduction.

5. Limitation

This research has certain restrictions. By approach, this research was an observational study. Therefore, a prospective research with more subjects and longer duration of follow up can help to establish the relationship between glycaemic parameters and risk factors. Also an extended period of follow - up may be beneficial in determining the correlation between risk factors and glycaemic markers.

6. Conclusion

- The purpose of the current study aimed to assess the correlation between glycosylated haemoglobin and Risk factors in individuals with T2DM receiving treatment.
- The study revealed Negative correlation between Hypertension and HbA1C.
- There was no correlation between HbA1C with Age, Sex, Duration of Diabetes, Smoking and BMI in our study.

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