Original Article

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Association between High Density Lipoprotein (HDL) and Glycosylated Haemoglobin (HbA1c) in Type 2 Diabetes Mellitus Patients Undergoing Angiography for Acute Coronary Syndrome

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Abstract

Background: To evaluate association between high density lipoprotein (HDL) and glycosylated hemoglobin (HbA1c) in type 2 diabetes mellitus patients undergoing angiography for Acute Coronary Syndrome (ACS). **Subjects and Methods :** Type 2 Diabetic patients who presented with Acute Coronary Syndrome were subjected to Angiography and Comparison of HDL & HbA1c level in view of single vessel or multi vessel Coronary Artery Disease was done to Evaluate association/correlation between HDL & HbA1c level with single/multi vessel Coronary Artery Disease. **Result:** In present study out of 90 subjects who have undergone C.A.G, 29 (32.22%) had S.V.D and 61 (67.78%) had M.V.D. In present study no. of male patients with S.V.D was 22 (75.86%) and females were 7 (24.14%). Whereas, no. of male patients with M.V.D were 45 (73.77%) and females were 16 (26.23%). Maximum no. of patients with S.V.D belong to age group <40 years (n=11, 37.93%). Maximum no. of patients with M.V.D belong to age group 51-60 years (n=26, 42.62%), Maximum patients had S.T.E.M.I i.e., n=73 (81.11%), whereas N.S.T.E.M.I was present in only 17 patients (18.89%). Among those with S.V.D, 72.41% (n=21) had HbA1c 6.5 to 8.4 and among 27.59% (n=8) had HbA1c >8.5. Among those with Multi vessel disease, 68.85% (n=42) had HbA1c >8.5 and 31.15% (n=19) had HbA1c of 6.5 to 8.4. There was significant inverse correlation present between level of H.D.L and number of vessel involved. Most of the patients with L.D.L ≥100 had Multi vessel disease (n=53, 86.99%). **Conclusion:** The severity of A.C.S, as measured by a single or multi-vessel disease on coronary angiography, is directly linked to poor glycemic management, as measured by a higher HbA1c. The severity of A.C.S is also linked to an abnormal lipid profile, such as elevated L.D.L and low-H.D.L.

Keywords: High Density Lipoprotein, Glycosylated Haemoglobin, Diabetes Mellitus

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Introduction

The term acute coronary syndrome (A.C.S) collection of medical symptom associated with myocardial infarction (M.I), including unstable angina, non-S.T segment elevated myocardial myocardial infarction (N.S.T.E.M.I), and S.T non-S.T segment elevated myocardial myocardial infarction (S.T.E.MI).[1,2]

Major Risk factors for coronary artery disease Include Smoking, hypertension, diabetes mellitus, dyslipidemia, a family history of C.A.D, and obesity.[2–4]

Diabetes is quick acquiring the situation within India with in excess of sixty-two million diabetic people at present with disease.[5,6]

HbA1c that reflects both fasting and PP plasma glucose fixation over the course of 90 days, and significant tool in diabetes treatment. Raised HbA1c level is firmly associated with the dangers of C.V disease and mortality.[7] Raised HbA1c level was associated with unfavorable result in without prior known diabetic patients with S.T.E.M.I.[8]

Despite great advancements in management, C.V.D and, more specifically, A.C.S continue to be a major cause of death around the world. Large population-based studies show that the typical C.V risk factor profile of patients has changed in recent years, as seen by significant reductions in the rate of severe M.I. There have been noticeable unfavorable trends in

the risk factor profile of M.I patients, which now includes a higher B.M.I, T.G levels, and a higher prevalence of T.2.D.M than in earlier years.[9,10]

This study was conducted to evaluate association between HDL and HbA1c level with ACS, & outcome will be helpful in prediction of type of CAD (single or multi vessel) in diabetic patients presenting with ACS, as multi-vessel CAD patients have high risk of mortality. HDL & HbA1c can act as potent indicating marker for Angiography in ACS patients, as all patients will not require to undergo Angiography. By the help of HDL & HbA1c we can explain the patients about the possibilities of severity of C.A.D, in diabetic presented with A.C.S followed by angiography. As promising evidence based medicine practice, these two tools helped us to explain the need & urgency of Angiography in all ACS patients.

Aim

- To evaluate association between high density lipoprotein (HDL) and glycosylated hemoglobin (HbA1c) in type 2 diabetes mellitus patients undergoing angiography for Acute Coronary Syndrome (ACS).

Objective

- To determine the level of HDL & HbA1c in type 2 diabetes mellitus patients presented with ACS undergoing angiography
- Find out the association between HDL and HbA1c in type 2 diabetes mellitus patients with severity of ACS evaluated by angiography in view of number of vessels involved.

Subjects and Methods

Study Design and Place

- This study will be carried out at Teerthanker Mahaveer medical College and Research Centre as an observational hospital based study.
- Written Informed consent to be obtained for clinical examination & lab investigations.

Study Population

- 90 cases of type 2 diabetes mellitus patients presented with ACS (who have undergone angiography) presenting to the Department of Medicine and Cardiology during the study period will be evaluated.

Inclusion Criteria

- Patients of type 2 diabetes mellitus [treated as well as treatment naive] presenting with acute coronary syndrome followed by coronary Angiography.

Exclusion Criteria

- Patients already on lipid lowering drugs.
- Patient with any condition confounding lipid profile.

Results

Table 1: SVD and MVD among the study subjects

CAG	N	%
SVD	29	32.22
MVD	61	67.78
Total	90	100

The present hospital based observational study was conducted in the Department of Medicine and Cardiology, Teerthanker Mahaveer Medical College & Research Centre, Moradabad, U.P. over a period of twelve months, after the approval of The Research Committee and The Ethical committee. This study was carried out including 90 cases of T.2.D.M patients presented with A.C.S (who have undergone angiography),after considering the inclusion and exclusion criteria.The written informed consent for clinical examination & lab investigations was obtained either from patient or attendant. In present study out of 90 subjects who have undergone C.A.G, 29 (32.22%) had S.V.D and 61 (67.78%) had M.V.D. [Table 1]

In present study no. of male patients with single vessel disorder (SVD) were 22 (75.86%) and females were 7 (24.14%). Whereas, no. of male patients with multi vessel disorder (MVD) were 45 (73.77%) and females were 16 (26.23%). The p value was not significant. [Table 2]

In the present study, maximum no. of patients with single vessel disorder (SVD) belong to age group <40 years (n=11, 37.93%). In SVD group, in >70 years age group n=7 (24.14%), 61-70 years age group n=5 (17.24%), 41-50 years age group n=4 (13.79%), and least were in 51-60 years age group n=2 (6.9%). Maximum no. of patients with multi-vessel disorder (MVD) belong to age group 51-60 years (n=26, 42.62%), followed by 41-50 years age group n=17 (27.87%), 61-70 years age group n=8 (13.11%), >70 years age group n=6 (9.84%) and least were in <40 years age group n=4 (6.56%). [Table 3]

In present study out of 90 subjects who have undergone C.A.G., maximum patients had S.T.E.M.I i.e., n=73 (81.11%), whereas N.S.T.E.M.I was present in only 17 patients (18.89%). Among all patients included in present trail 61 patient (67.78%) had history of hypertension, 32 (35.56%) patient were smokers and 27 patients (30%) gave history of alcohol consumption. [Table 4]

Table 2: Gender distributionaccordingto SVD and MVD

Gender	CAG				p value
	SVD		MVD		
	N	%	N	%	
Male	22	75.86	45	73.77	0.79
Female	7	24.14	16	26.23	
Total	29	100	61	100	

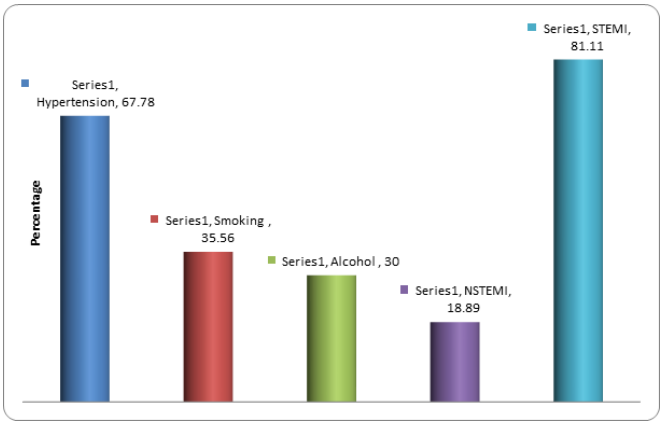
Table 3: Age distribution according to SVD and MVD

Age Group (in years)	CAG				p value
	SVD		MVD		
	N	%	N	%	
<40	11	37.93	4	6.56	0.021*
41-50	4	13.79	17	27.87	
51-60	2	6.90	26	42.62	
61-70	5	17.24	8	13.11	
>70	7	24.14	6	9.84	
Total	29	100	61	100	

*: statistically significant

Table 4: History and profile among the study subjects

Variables	N	%
Hypertension	61	67.78
Smoking	32	35.56
Alcohol	27	30.00
NSTEMI	17	18.89
STEMI	73	81.11



In the present study there was significant association between H.b.A.1.c levels and C.A.G among diabetics. I.e. among those with single vessel disease, 72.41% (n=21) had H.b.A.1.c 6.5 to8.4 and among 27.59% (n=8) had HbA1c >8.5. Among those with Multi vessel disease, 68.85% (n=42) had H.b.A..1c >8.5 and 31.15% (n=19) had H.b.A.1.c of 6.5 to 8.4. So total no. of patients with HbA1c of 6.5 to 8.4 were 40 (44.44%) and with H.b.A.1.c >8.5 were 50 (55.56%). [Table 5] And mean H.b.A.1.c in patients with S.V.D is 7.11, among those with multi vessel 9.08.

In the present study, there was significant inverse correlation present between level of H.D.L and number of vessel involved. Most of the patients with H.D.L <40 (n=49, 80.33%) had M.V.D and least with H.D.L ≥40 (n=12, 19.67%) had M.V.D. No. of patients with H.D.L <40 (n=6, 20.69%) had S.V.D and with H.D.L ≥40 (n=23, 79.31%) had S.V.D. And mean H.D.L in patients with S.V.D is 49.56, among those with multi vessel 9.08. [Table 6]

Table 5: Comparison among the study subjects according to HbA1c

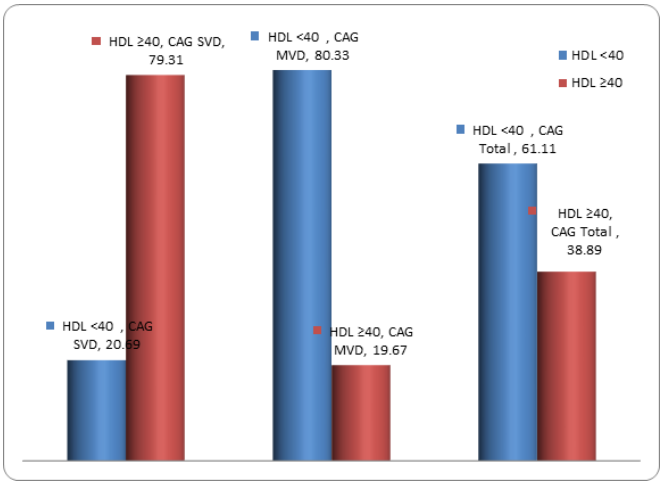
HbA1c	CAG						p value
	SVD		MVD		Total		
	N	%	N	%	N	%	
6.5-8.4	21	72.41	19	31.15	40	44.44	<0.01*
≥8.5	8	27.59	42	68.85	50	55.56	
Total	29	100	61	100	90	100	
Mean±SD	7.11±0.68		9.08±1.03				<0.01*

*: statistically significant

Table 6: Comparison among the study subjects according to HDL

HDL	CAG						p value
	SVD		MVD		Total		
	N	%	N	%	N	%	
<40	6	20.69	49	80.33	55	61.11	<0.01*
≥40	23	79.31	12	19.67	35	38.89	
Total	29	100	61	100	90	100	
Mean±SD	49.56±.68		9.08±1.03				<0.01*

*: statistically significant



In the present study, LDL also had significant correlation with C.A.D. LDL ≥100 have Multivessel disease (n=53, 86.99%). No. of patients with LDL<100 in MVD group were 8 (13.11%). No. of patients with LDL<100 in SVD group were 9 (31.03%) and with LDL ≥100 were 20 (68.97%). The mean LDL among those with SVD, is 106.64 and those with multi vessel involvement is138.52. Total no. of patient with LDL<100 were 17 (18.89%) and with LDL ≥100 were 73 (81.11%). [Table 7]

In the present study, there was a significant inverse correlation between levels of H.D.L and H.B.A.1.c. [Table 8]

Discussion

The present hospital based observational study was conducted in the Department of Medicine and Cardiology, Teerthanker Mahaveer Medical College & Research Centre, Moradabad, U.P. over a period of twelve months, after the approval of The Research Committee and The Ethical committee. This study was carried out including 90 cases of T.2.D.M patients presented with A.C.S (who have undergone angiography), after considering the inclusion and exclusion criteria. The findings of the study are summarized as below: In present study out of 90 subjects who have undergone C.A.G, 29 (32.22%) had S.V.D and 61 (67.78%) had M.V.D. In present study no. of male patients with S.V.D was 22 (75.86%) and females were 7 (24.14%). Whereas, no. of male patients with M.V.D were 45 (73.77%) and females were 16 (26.23%). According to findings of Baligar et al,[11] (2019) out of 50 included patients, 32 were males and 18 were females. Hu et al,[12] (2020) found that of the total patients involved in study 75.3% were males. Wang et al,[13] (2015)showed in their study that patients with CAD were more frequently males. In the present study, maximum no. of patients with S.V.D belong to age group <40 years (n=11, 37.93%). In S.V.D group, in >70 years age group n=7 (24.14%), 61-70 years age group n=5 (17.24%), 41-50 years age group n=4 (13.79%), and least were in 51-60 years age group n=2 (6.9%). The findings of present trial were in accordance with findings of Baligar et al (2019).[11] Maximum no. of patients with M.V.D belong to age group 51-60 years (n=26, 42.62%), followed by 41-

Table 7: Comparison among the study subjects according to LDL

LDL	CAG						p value
	SVD		MVD		Total		
	N	%	N	%	N	%	
<100	9	31.03	8	13.11	17	18.89	0.005*
≥100	20	68.97	53	86.99	73	81.11	
Total	29	100	61	100	90	100	
Mean±SD	106.64±17.91		138.52±23.89				<0.01*

*: statistically significant

Table 8: Correlation between HDL and HBA1c

Parameters	Value
r value	-0.59
p value	<0.01*

*: statistically significant

50 years age group n=17 (27.87%), 61-70 years age group n=8 (13.11%), >70 years age group n=6 (9.84%) and least were in <40 years age group n=4 (6.56%). In the present trial among diabetics there was significant association between age and C.A.G. In present study out of 90 subjects who have undergone C.A.G, maximum patients had S.T.E.M.I i.e., n=73 (81.11%), whereas N.S.T.E.M.I was present in only 17 patients (18.89%). Among all patients included in present trail 61 patient (67.78%) had history of hypertension, 32 (35.56%) patient were smokers and 27 patients (30%) gave history of alcohol consumption. Findings present trial were accordance with findings of Baligar et al (2019).[11] According to findings of Baligar et al,[11] (2019) 64% patient ECG showed STEMI. In the present study there was significant association between HbA1c levels and C.A.G among diabetics. I.e. among those with S.V.D, 72.41% (n=21) had HbA1c 6.5 to 8.4 and among 27.59% (n=8) had HbA1c >8.5. Among those with Multi vessel disease, 68.85% (n=42) had HbA1c >8.5 and 31.15% (n=19) hadHbA1c of 6.5 to 8.4. So total no. of patients with HbA1c of 6.5 to 8.4 were 40 (44.44%) and with HbA1c >8.5 were 50 (55.56%) and mean HbA1c in patients with S.V.D is 7.11, among those with multi vessel 9.08.

In the present study, there was significant inverse correlation present between level of H.D.L and number of vessel involved. Most of the patients with H.D.L <40 (n=49, 80.33%) had M.V.D and least with H.D.L ≥40 (n=12, 19.67%) had M.V.D. No. of patients with H.D.L <40 (n=6, 20.69%) had S.V.D and with H.D.L ≥40 (n=23, 79.31%) had S.V.D. And mean H.D.L in patients with S.V.D is 49.56, among those with multi vessel 9.08.

In the present study, L.D.L also had significant correlation with severity of coronary artery disease. Most of the patients with L.D.L ≥100 had Multi vessel disease (n=53, 86.99%). No. of patients with L.D.L<100 in M.V.D group were 8 (13.11%). No. of patients with L.D..L<100 in S.V.D group were 9 (31.03%) and with L.D.L ≥100 were 20 (68.97%). The mean L.D.L among those with S.V.D is 106.64 and those with multi vessel involvement is138.52. Total no. of patient with L.D.L<100 were 17 (18.89%) and with L.D.L ≥100 were 73 (81.11%).

Comparable were the discoveries of Baligar et al (2019),[11] who found that there was a measurably huge direct co-relationship HbA1c, L.D.L, Total cholesterol, A.C.S seriousness (S.V.D/M.V.D) and reverse co-relationship with H.D.L.

Conclusion

Based on this study, we believe that the severity of A.C.S, as measured by a single or multi-vessel disease on coronary angiography, is directly linked to poor glycemic management, as measured by a higher HbA1c. The severity of A.C.S is also linked to an abnormal lipid profile, such as elevated L.D.L and low-H.D.L. As a result, we conclude that early therapeutic measures aimed at stabilizing blood glucose levels while lowering HbA1c and L.D.L, absolute cholesterol, and increasing H.D.L significantly reduce cardiovascular events and mortality in diabetic patients.

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