

Correlation of HbA1c Levels with Monocyte-lymphocyte and Platelet-lymphocyte Ratios in Type 2 Diabetics of Bengaluru City

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Abstract

Background: Diabetes mellitus (DM) is a systemic disease having serious microvascular and macrovascular complications. These complications in type 2 DM has an inflammatory pathology. Many inflammatory markers have been found to be related to these complications, such as interleukin1 (IL1), IL6, IL8, transforming growth factor beta 1 (TGF- β 1) and tumour necrosis factor alpha (TNF α). However, their measurement is not used routinely as it is not easy to do it, in this respect. The white blood cell (WBC) count and its subtypes are classic indicators of inflammation and their measurement is done routinely and also their estimation is cost effective.

Aim of the Work: To correlate HbA1c levels with monocyte-lymphocyte and platelet-lymphocyte ratios in type 2 diabetics of Bengaluru city.

Materials and Method: A total of 50 type 2 diabetics without complications were included in the study with a mean age of 55.78 (SD:13.77) years of both gender previously diagnosed regardless of their sociodemographic characteristics and were invited for the assessment of complete blood count (CBC) and HbA1c levels in Infilife healthcare private limited of Bengaluru city. The platelet-lymphocyte ratio and monocyte-lymphocyte ratio were calculated as the ratios of the platelets and monocytes to lymphocytes, respectively. All counts were determined from the same automated blood sample measurement.

Results: Mean (SD) P/L ratio and M/L ratio were 0.14 (0.36) & 7.37 (3.43) respectively. There was no significant correlation (at $p=0.05$) between HbA1c levels and P/L ratio [$r= (-0.46)$] and L/M ratio [$r=0.05$].

Conclusion: In the present study, there was no statistically significant correlation between HbA1c levels and P/L ratio [$r= (-0.46)$] and L/M ratio [$r=0.05$] in patients with type 2 diabetes mellitus of Bengaluru city.

Keywords: HbA1c, monocyte-lymphocyte and platelet-lymphocyte ratios, type 2 diabetes mellitus.

Introduction

Diabetes mellitus (DM) is a systemic disease having serious microvascular and macrovascular complications. Microvascular complications include diabetic nephropathy (DN), diabetic retinopathy, and

diabetic neuropathy while macrovascular complications include stroke, cardiovascular diseases (CVDs), and peripheral vascular diseases¹.

Subclinical inflammation contributes to enhancement of metabolic disturbances, which eventually leads to vascular complications, a major cause of morbidity and mortality in diabetic patients^{2, 3}.

The white blood cell (WBC) count and its subtypes are classic indicators of inflammation⁴. The platelet-to-lymphocyte ratio (PLR), monocyte-to-lymphocyte ratio (MLR), and neutrophil-to-lymphocyte ratio (NLR) are

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potential markers of inflammation in various conditions, including tumours^{5,6,7}, cardiovascular conditions^{8,9} and other diseases¹⁰.

Turkmen et al.¹¹ showed that platelets can interact with various cell types, including endothelial cells, T-lymphocytes, neutrophils and mononuclear phagocytes, in which earlier investigations strongly suggested that chronic inflammation, may contribute to the development of atherosclerosis.

Therefore the present study was attempted to explore the correlation between HbA1c levels and platelet-lymphocyte ratio and lymphocyte-monocyte ratio in patients with type 2 diabetes mellitus.

Materials and Method

In the current, cross-sectional investigation, a total of 50 patients with mean age of 55.78 (SD:13.77) years of both gender and previously diagnosed with type 2 diabetes recorded in their medical records and confirmed by the study author in Infilife healthcare private limited, Bengaluru, were invited for the study purposes between December 2017 and April 2018.

The patients met eligibility criteria if they were male or female, on insulin, oral anti-diabetic agents, or its combination regardless of their sociodemographic aspects. The patients with pregnancy, Type 1 diabetes mellitus, gestational diabetes or breastfeeding mothers and those with acute conditions such as acute myocardial infarction, acute diabetic ketoacidosis, acute pulmonary embolism, acute pulmonary oedema, and acute chest infection were not included in the study. In addition, patients with clinical proximal myopathy; renal, hepatic, other endocrinological disorders, malignancies diagnosed on the basis of history were excluded from the study. Patients on any medications (except oral antidiabetic agents or insulin) that may have affected the results of the study and inflammation parameters; patients with history of smoking or high levels of triglycerides; patients taking aspirin or statins; presence of inflammation were also excluded from the study.

Fasting venous blood was drawn from all the 50 participants attending the out-patient department of Infilife Healthcare Private Limited, Bengaluru.

HbA1c was analysed on a cation exchange column chromatograph using an automated high-pressure liquid chromatography instrument.

The platelet-lymphocyte ratio and monocyte-lymphocyte ratio were calculated as the ratios of the platelets and monocytes to lymphocytes, respectively. All counts were determined from the same automated blood sample measurement.

Results

A total of 50 diabetics were included in the study with a mean (SD) age of 55.78 (13.77) years.

Table 1: Age and gender distribution of the study population

Age (Years)	Male	Female	Total (%)
25-45	10 (34.48%)	3 (14.29%)	13 (26%)
46-65	10 (34.48%)	9 (42.86%)	19 (38%)
>65	09 (31.03%)	9 (42.86%)	18 (36%)
Total	29 (100%)	21 (100%)	50 (100%)

Among 50, 29 (58%) were males with a mean (SD) age of 53.20 (14.29) years and the rest 21 (42%) were females with a mean (SD) age of 59.33 (12.48) years

Table 2: Mean and standard deviation of HbA1c, FBS, PPBS, P/L and M/L ratios of the study population

	Mean	Std. Deviation	N
HbA1c (%)	7.600	2.0021	50
FBS (Mg/dl)	144.040	70.5720	50
PPBS (Mg/dl)	202.640	100.5353	50
P/L Ratio	.1380	.36714	50
M/L Ratio	.1560	.06289	50

Mean (SD) Hba1c levels were 7.60% (2.01).

Mean (SD) FBS and PPBS levels were 144.04mg% (70.57) & 202.64mg% (100.53) respectively.

Mean (SD) P/L ratio and M/L ratio were 0.14 (0.36), 0.16 (0.06) respectively.

There was no significant difference between Males and Females in the levels of Hba1c, FBS, PPBS levels There was a statistically significant correlation between Hba1c levels and FBS ($r=0.87$, $p<0.05$), PPBS ($r=0.87$, $p<0.05$).

Table 3: Correlation statistics of the study population

		HbA1c (%)	FBS (Mg/dl)	PPBS (Mg/dl)	P/L Ratio	M/L Ratio
HbA1c (%)	Pearson Correlation	1	.869**	.872**	-.046	.049
	Sig. (2-tailed)		.000	.000	.751	.735
	N	50	50	50	50	50
FBS (Mg/dl)	Pearson Correlation	.869**	1	.911**	-.053	.123
	Sig. (2-tailed)	.000		.000	.715	.395
	N	50	50	50	50	50
PPBS (Mg/dl)	Pearson Correlation	.872**	.911**	1	-.016	.077
	Sig. (2-tailed)	.000	.000		.910	.597
	N	50	50	50	50	50
P/L Ratio	Pearson Correlation	-.046	-.053	-.016	1	-.084
	Sig. (2-tailed)	.751	.715	.910		.562
	N	50	50	50	50	50
M/L Ratio	Pearson Correlation	.049	.123	.077	-.084	1
	Sig. (2-tailed)	.735	.395	.597	.562	
	N	50	50	50	50	50

There was no significant correlation (at $p=0.05$) between HbA1c and P/L ratio [$r=(-0.46)$] and M/L ratio [$r=0.00$]

Discussion

There was no statistically significant correlation of HbA1c level with monocyte-lymphocyte and platelet-lymphocyte ratios in the current study conducted on 50 type 2 diabetics of Bengaluru city.

White blood cell (WBC) count is linked to various components of metabolic syndrome, and subclinical inflammation may be associated with the increased cardiovascular risk in patients with impaired glucose tolerance.¹² Furthermore, a link has been shown between chronic subclinical inflammation and insulin resistance, metabolic syndrome and atherosclerosis.¹³

Low-grade chronic inflammation is associated with increased cardiometabolic risk.¹⁴ The process of atherosclerosis is known to involve inflammatory mechanisms,¹⁵ and leukocytosis is directly associated with the pathogenesis of both atherosclerosis and metabolic syndrome.^{16, 17}

Data generated from research has supported a close association of systemic inflammatory processes with oxidative stress, leading to alterations of platelet and lymphocyte levels.¹⁸⁻¹⁹ Thus, the underlying mechanism of up-regulated PLR may also be based on the dysfunction of the inflammatory response. Studies have proposed that hyperglycemia may lead to an excessive oxidation reaction in the tricarboxylic acid cycle, leading to an increase in the generation of reactive oxygen

species (ROS). As a result, mitochondrial function is impaired during the production of ROS.²⁰⁻²³ Fengming et al showed the dysfunction of mitochondria found in platelets, which lead to lower platelet viability in a rat model of DM and higher platelet counts in patients.²⁴

Demirtas et al.²⁵ confirmed that PLR levels were found to be independent predictor of diabetes and to be independent predictor of impaired glucose regulation in diabetic patients with diabetic nephropathy.

A study by Song Yue et al.²⁶ revealed the MLR correlated with the presence of diabetic retinopathy and was an independent risk factor.

The results of our study showed that there was no statistically significant correlation between HbA1c levels and monocyte-lymphocyte, platelet-lymphocyte ratios in type 2 diabetics. This is in contrast to the results of the above quoted studies. In all the above studies quoted, PLR and MLR were investigated in type 2 diabetics with complications like nephropathy or retinopathy. In our study, the study population of type 2 diabetics were selected based on the exclusion criteria that the type 2 diabetics did not have any existing co-morbidities. And with the mean HbA1c levels being 7.60% (2.01), they did not correlate with MLR and PLR.

Limitations of the present study was small sample size; further large sample size prospective studies are required in this direction.

Conclusions

The current study showed there was no statistically significant correlation between HbA1c levels and monocyte-lymphocyte, platelet-lymphocyte ratios in type 2 diabetics.

Conflict of Interest: This study authors declare that there is no conflict of interests regarding the publication of this article.

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