Ann Med Res 2021;28(2):258-60

Annals of Medical Research

DOI: 10.5455/annalsmedres.2020.02.173

Original Article

Monocyte count / HDL cholesterol ratio: A new marker in diabetic retinopathy

Ihsan Solmaz[1], Mine Karahan[2]

[1]Clinic of Internal Medicine, University of Health Sciences Turkey Gazi Yaşargil Education and Research Hospital, Diyarbakir, Turkey
[2]Department of Eye, Faculty of Medicine, Dicle University, Diyarbakir, Turkey

Abstract

Aim: Diabetic retinopathy (DRP) makes up a significant portion of visual impairments. DRP is divided into proliferative and non-proliferative forms. Monocytes contribute to inflammation, whereas HDL reinforces the reversal of inflammation through promoting anti-inflammatory pathways. The monocyte-to-HDL cholesterol ratio (MHR) is one of the indicators that have been included in recent inflammation studies. This study aims to investigate the diagnostic value of MHR and whether it can be utilized as an indicator of diabetic retinopathy.

Materials and Methods: This study includes patients diagnosed at least 5 years ago with type II diabetes mellitus (DM) who are ≥ 18 years old and have an HbA1c value > 6.5. The control group is made up of patients aged ≥ 18 years that presented to the outpatient clinic for other ailments of the eye. The data were prospectively recorded through the hospital information system. The subjects were divided into 3 groups: proliferative retinopathy, non-proliferative retinopathy, and control.

Results: The study included a total of 200 subjects: 70 patients with diabetic non-proliferative retinopathy, 87 patients with diabetic proliferative retinopathy, and 43 patients without retinopathy. There were 92 male (46%) and 108 female patients (54%). The mean age was 66.35 ± 11.3 years (19-96). In this prospective observational study, we found that the MHR values of experimental and control groups were significantly different (p = 0.046). The post hoc Tukey's honest significant difference (HSD) test revealed a statistically significant difference between the control and proliferative retinopathy groups (p = 0.040), but not the non-proliferative retinopathy group (p = 0.125).

Conclusion: MHR has diagnostic potential for diabetic retinopathy, especially for the proliferative form.

Keywords: Monocyte-to-HDL ratio; retinopathy; diabetes

INTRODUCTION

Diabetic retinopathy (DRP) makes up a significant portion of visual impairments. It develops as a result of the destruction of capillaries, venules, and arterioles in the retina due to hyperglycemia or insulin deficiency (1). The prevalence of retinopathy is 35%, and the prevalence of proliferative retinopathy – which has an increased risk of visual impairment – is 7%, which is subject to change as per the population or the diagnostic method (2).

DRP is divided into proliferative and non-proliferative forms. In the non-proliferative stag DRP lesions are limited only to the retina. As the disease progresses, neovascularization can lead to damage in the optic nerve or the macula, vitreous hemorrhage and retinal detachment (1).

Early diagnosis is crucial in DRP. There currently are not any DRP markers, and the diagnosis is usually made during routine eye examinations with ophthalmoscopy. MPV, the neutrophil-to-lymphocyte ratio (NLR), RDW elevation and the platelet-to-lymphocyte ratio (PLR) were studied in the context of inflammation in chronic micro- and macrovascular complications of diabetes (3-6).

Monocytes contribute to inflammation, whereas HDL reinforces the reversal of inflammation while promoting anti-inflammatory pathways (7). The monocyte count-to-HDL cholesterol ratio (MHR) is one of the indicators that have been included in recent diabetes studies (8, 9).

Low HDL values and a high monocyte count seem to be an indirect indicator of inflammation. MHR provides valuable information about existing inflammation where

Received: 25.02.2019 **Accepted:** 06.06.2020 **Available online:** 18.02.2021
Corresponding Author: Ihsan Solmaz, Clinic of Internal Medicine, University of Health Sciences Turkey Gazi Yaşargil Education and Research Hospital, Ankara, Turkey, **E-mail:** ihsan2157@gmail.com

several studies concerning MHR have established its role in predicting inflammation (8-9).

This study aims to investigate the diagnostic value of MHR, a neglected indicator, and whether it can be utilized as an indicator of diabetic retinopathy.

MATERIALS and METHODS

The study includes patients that were diagnosed with type II diabetes mellitus (DM) in the Diyarbakir Gazi Yasargil Training and Research Hospital Internal Medicine or Endocrine Clinics and were found to have developed DRP during routine eye examinations. The control group is made up of non-diabetic patients that were examined for other ailments of the eye. The data were prospectively recorded through the hospital information system. The subjects were divided into 3 groups: proliferative retinopathy, non-proliferative retinopathy, and control. The inclusion criteria were as follows: (a) diagnosed and followed up with type II DM for at least 5 years, (b) aged ≥ 18 years, and (c) HbA1c value > 6.5. The control group was made up of non-diabetic patients aged ≥ 18 years.

Ethical considerations: All patients gave written consent to participate in the study. The study was granted ethical approval by the Ethics Committee of Diyarbakir Gazi Yasargil Training and Research Hospital (Date: 28/06/2019, Decision Number: 311).

Statistical analysis: Quantitative data are presented as mean ± standard deviation (minimum-maximum), and categorical data are expressed as frequencies (percent). The data were analyzed using SPSS version 22.0. Shapiro-Wilk and Levene tests were used to determine the normality and homogeneity of the distribution, respectively. One-way ANOVA and post hoc Tukey's HSD tests were used for statistical analysis. $p < 0.05$ was accepted as statistically significant.

RESULTS

This study includes patients diagnosed at least 5 years ago with type II diabetes mellitus (DM) that are ≥ 18 years old and have an HbA1c value > 6.5. The control group is made up of patients aged ≥ 18 years that presented to the outpatient clinic for other ailments of the eye. A total of 200 patients were included in the study:

Seventy patients with diabetic non-proliferative retinopathy, 87 patients with diabetic proliferative retinopathy, and 43 patients without retinopathy. There were 92 male (46%) and 108 female patients (54%). The mean age was 66.35 ± 11.3 years (19-96). The HbA1c values of proliferative and non-proliferative groups were statistically similar, with a mean value of 8.91 (Table 1).

Table 1. Distribution of patients according to groups

	Number of Patients n (%)	Age mean ± SD	Male n (%)	Female n (%)	HbA1c (%)
Control Group	43 (21.5)	72.5 ± 11.3	20 (46.5)	23 (53.5)	-
Non- proliferative	70 (35)	64.7 ± 11.9	36 (51.4)	34 (50.6)	9.07
Proliferative	87 (43.5)	64.6 ± 9.8	36 (41.3)	51 (58.7)	8.79
Total	200 (100%)	66.35 ± 11.3	92 (46%)	108 (54%)	8.91

The MHR values of the experimental and control groups were significantly different ($p = 0.046$). The post hoc Tukey's HSD test revealed a statistically significant difference between the control and proliferative retinopathy groups ($p = 0.040$), but not the non-proliferative retinopathy group ($p = 0.125$) (Table 2).

Table 2. Statistical difference between groups

	Control Group	Non-proliferative	Proliferative
Age	72.5 ± 11.3	64.7 ± 11.9	64.6 ± 9.8
MHR *	0.011438 ± 0.0534	0.014418 ± 0.0076	0.013619 ± 0.0059**

*** MHR: monocyte-to-HDL cholesterol ratio, ** p = 0.040 when compared to the control group (post hoc Tukey's test)**

DISCUSSION

Diabetic patients can develop microvascular (retinopathy, neuropathy, and nephropathy) and macrovascular (coronary artery disease, etc.) complications in the long term. DM-related disruptions in blood viscosity, capillary basement membrane thickness, capillary permeability and platelet functions cause microvascular complications depending on the irregularity of blood glucose levels and the duration of the disease. Diabetic retinopathy is one of the most important microvascular complications (10).

Monocytes contribute to inflammation, whereas HDL reinforces the reversal of inflammation while promoting anti-inflammatory pathways (7). The monocyte count-to-HDL cholesterol ratio (MHR) is one of the indicators that have been included in recent diabetes studies (8, 9).

Previous studies investigated the value of several

hematological parameters (NLR, PLR, MPV, TLR) as inflammatory markers, but MHR has been neglected. We investigated the diagnostic value of MHR for DPR and whether it can be utilized as a clinical indicator.

Several studies investigate MHR in the context of both macrovascular and microvascular complications of diabetes. Kundi et al. reported a correlation between SYNTAX scores and MHR values in patients with coronary artery disease (11), and Cetin et al. reported that MHR is an independent indicator of the severity of coronary artery disease and future major cardiovascular events in patients with acute coronary syndrome (12).

Karatas et al. suggested that increased MHR may be a biomarker for diabetic nephropathy (13). Vural et al. reported increased MHR values for diabetic axonal polyneuropathy patients, and that MHR could be used for the diagnosis of diabetic neuropathy (14).

Pençe et al. did not find that MHR could be used as a marker of cardiovascular risk specifically in patients with diabetic neuropathy, but they found a correlation between MHR and cardiovascular risk in all patients (15).

There are not enough studies concerning the association between diabetic retinopathy and MHR. In this study, we prospectively observed findings from 200 patients with and without DRP and found that there was a statistically significant difference between the experimental and control groups. The post hoc Tukey's HSD test revealed a statistically significant difference between the control and proliferative retinopathy groups ($p = 0.040$), but not the non-proliferative retinopathy group ($p = 0.125$).

Considering that the MHR values of control and non-proliferative retinopathy groups were not significantly different and that the HbA1c values of the proliferative and non-proliferative DRP groups were similar, it can be inferred that MHR is not affected by diabetes, but only by the proliferation process. We think this is a significant finding that indicates the value of MHR as a marker for diabetic proliferative retinopathy.

Limitations of the Study: The most important limitation of the study is the small sample size. We recommend further studies investigating the relationship between MHR in diabetic retinopathy patients with larger patient groups.

CONCLUSION

We conclude that MHR can be utilized as an inflammatory marker in diabetic retinopathy, especially in proliferative retinopathies. Further studies with longer follow-ups and larger sample sizes are needed to establish a strong correlation between MHR and DRP.

Conflict of interest : The authors declare that they have no competing interest.

Financial Disclosure: There are no financial supports.

Ethical approval: The study was granted ethical approval by the Ethics Committee of Diyarbakir Gazi Yasargil Training and Research Hospital (Date: 28/06/2019, Decision Number: 311).

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