

# CORRELATION BETWEEN GLYCATED HAEMOGLOBIN A1C AND RED BLOOD CELL INDICES IN PATIENTS WITH TYPE 2 DIABETES

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## BACKGROUND

The glycated haemoglobin A1c (**HbA1c**) measures the presence of glucose over the last three months.

This period of 120 days is equivalent to the lifespan of a red blood cell (**RBC**) which suggests that **HbA1c** is affected by **RBCs** conditions. However, the association of **HbA1c** with **RBC** parameters is not widely investigated.

The aim of this study was to investigate this association between **HbA1c** and **RBCs** indices in patients with type 2 diabetes mellitus (**T2DM**).

## METHODS

It was a retrospective study including patients with **T2DM** for whom an **HbA1c** test and Complete Blood Count (**CBC**) were carried out in our laboratory.

The **RBC indices** studied:

- Red Blood cell Count (**RBC**)
- Haemoglobin (**Hb**)
- Haematocrit (**HCT**)
- Mean Corpuscular Volume (**MCV**)
- Mean Corpuscular Haemoglobin (**MCH**)
- Mean Corpuscular Haemoglobin Concentration (**MCHC**)
- Red cell Distribution Width (**RDW**)

Statistical analysis was performed using SPSS v 26.

## RESULTS AND DISCUSSION

115 patients with **T2DM** were included in this study

Mean age = 62 ±11 years

Sex ratio (M/F) = 0.47

Table I: Mean levels of studied parameters

	HbA1c	RBC	Hb	HCT	MCV	MCH	MCHC	RDW
Mean levels	9.53	4.79	13.27	39.91	83.67	27.82	33.09	13.43
	±2.29%	±0.58 G/mm3	±1.78 g/dL	±4.47%	±6.79 fL	±3.08 pg	±1.73 g/dL	±1.71%

The correlation between **HbA1c** and **RBC indices** indicated that **HbA1c** was positively correlated with **RBC**, with **Hb** and with **MCHC** while it was reversely correlated with **RDW**.

Table II: Correlation between RBC indices and HbA1c

	r	p-value
<b>RBC</b>	0,228	0,014
<b>Hb</b>	0,232	0,013
<b>MCHC</b>	0,208	0,025
<b>RDW</b>	-0,240	0,009

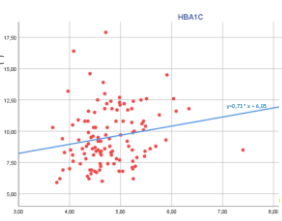


Figure 1: Correlation between RBC and HbA1c

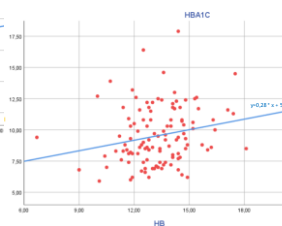


Figure 2: Correlation between RBC and Hb

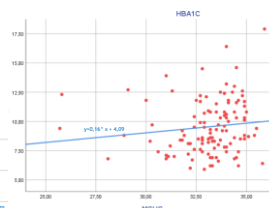


Figure 3: Correlation between RBC and MCHC

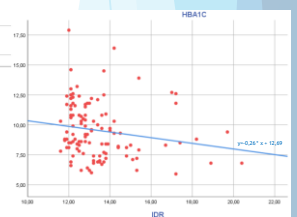


Figure 4: Correlation between RBC and RDW

However, no significant correlation of **HbA1c** with **HCT**, **MCV** and **MCH** was documented.

Our study showed a significant correlation between some **RBC indices** and **HbA1c** levels. This finding has also been reported in other multiple studies. An Ethiopian study (1) among diabetic patients showed a significant correlation between **RBC** and **HbA1c** levels while a study conducted by Abass and al. (2) among diabetic pregnant patients found significant correlation between **Hb**, **MCHC** and **HbA1c**. However, they did find a significant association between **HCT** and **HbA1c** levels, which is in contrast to our results.

## CONCLUSION

Our study showed that **HbA1c** values could be affected by erythrocyte parameters, although further large studies are needed to fully elucidate the relationship between them. Nevertheless, this correlation must be taken into account particularly when interpreting **HbA1c** values in diabetic patients who suffer simultaneously from anaemia, hemoglobinopathy or other conditions affecting **RBCs**.

### References:

- (1) Meshesha MF, Melke A, Ajema AT, Mayisso K. Evaluation of Red Blood Cell Indices for Prediction of Glycemic Control in People Living with Type 2 Diabetes. *Diabet Metabol Syndr Obes*. Feb 2024 ;2024(17):619-32. doi: <https://doi.org/10.2147/DMSO.S445331>
- (2) Abass AE, Musa IR, Rayis DA, Adam I, Gasim I. Glycated hemoglobin and red blood cell indices in non-diabetic pregnant women. *Clin Pract* 2017;7(4):999. doi: [10.4081/cp.2017.999](https://doi.org/10.4081/cp.2017.999)