Alternate biomarker for monitoring glycaemic status in diabetes

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In a diabetic condition the glucose binds to blood proteins like haemoglobin. The belief that glycated haemoglobin provides an estimate of glucose levels of preceding three months is debatable. The existing method used to monitor blood sugar control has certain disadvantages. There is a need to accurately monitor patients of diabetes mellitus. CSIR-National Chemical Laboratory has come up with a novel method to accurately diagnose for diabetes mellitus.

In a diabetic condition there is an increase in the blood glucose levels; as a result glucose binds non-enzymatically to the blood proteins like haemoglobin. Since the lifespan of red blood cells is about three months, measuring glucose-bound haemoglobin (commonly referred to as glycated haemoglobin; HbA1c/A1c), is considered to provide an estimate of glucose levels of the preceding three months. Non-enzymatic binding of glucose to proteins is called glycation. In the beginning glycation is reversible and later it transforms into an irreversible reaction; this is called advanced glycation.

However, the glucose bound to haemoglobin remains stable only for about 15 days; thereafter, it gets transformed to another product, i.e. carboxymethylated form of haemoglobin, which is in an advanced stage of glycation and relatively more stable. Therefore, whether HbA1c provides mean glucose status of the preceding three months is debatable. Also, there are limitations in accurate quantification of HbA1c. To overcome the disadvantages of the existing method for accurately monitoring diabetes, CSIR-National Chemical Laboratory (CSIR-NCL), Pune has come up with a novel method to diagnose for diabetes mellitus and its associated complications. The researchers measured more advanced glycated products – carboxyethylvaline (CEV) and carboxymethylvaline (CMV), which form the modified composition of haemoglobin. These products were found to be elevated and better correlated with diabetes and its complications. The study was successfully carried out on 40 clinical patients using mass spectrometry, which has the ability to differentiate the isoforms of haemoglobin and can be quantified precisely.

Both CMV and CEV markers showed better correlation with severity of diabetes in terms of fasting glucose, postprandial glucose, lipid profile and microalbuminuria. Hence, quantification of CMV and CEV of haemoglobin may provide avenues for improved screening and diagnosis of diabetes mellitus.

The research study carried out may open the doors for better management strategies to newer therapies. A United States patent application (20170074888) has been filed and a paper[1] has been published based on this study.

1. Mashanipalya, G. *et al.*, *Clin. Proteomics*, 2016, **13**, 7.

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