

Novel Screening Method for Diabetes Mellitus

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I. INTRODUCTION

Diabetes mellitus is a metabolic disorder signaled by elevated blood glucose concentration. The incidence of type 2 diabetes mellitus is high (90-95%). It is denoted by peripheral insulin resistance and inability of compensatory mechanism of pancreatic beta cells with greater insulin secretion⁽¹⁾. The type 2 diabetes mellitus remains anonymous for ages because hyperglycaemia develops gradually and there are no symptoms at all⁽²⁾. The early detection of the origination of risk factors should be done. Remodelling of lifestyle and hyperglycaemic alteration results in the fall behind of appearance and complication of the disease. In case of asymptomatic adults scrutinizing is an important aid in the early diagnosis of the diabetes that paves way for the eluding of future complication. The augmentation of prevalence of metabolic syndrome is exorbitant in paediatric population.

II. NOVEL SCREENING METHODS

Non-invasive breath test method⁽³⁾

Novel breath test method may facilitate in identification of pre-diabetic or early stage diabetes in the risk persons resisting the need for invasive blood sampling. Hence it paves way for large scale testing of at-risk populations, such as children. Usually this method was executed by gathering the breath samples at baseline and every 30 minutes for 10 hours' period after gulp of 75 g glucose labelled with 150 mg glucose. Subsequently glucose derived breath CO₂ was significantly lower in Pre-diabetic or early stage diabetes patients when compared with normal glucose tolerance patients from 1 to 3.5 hours after gulp of glucose. Generally Standard infra-red CO₂ analyser was used for the purpose of non-invasive breath test method.

Glutamate decarboxylase (GAD) antibody⁽⁴⁾

Glutamate Decarboxylase (GAD) antibody has been found in patients with recent-onset insulin dependent diabetes mellitus. Several analytical methods are described for detection and quantification of anti-GAD antibodies whereas the inhibition of the enzyme activity by anti-enzyme antibody is given little consideration.

Other antibodies associated with type 1 diabetes include:

- islet cell cytoplasmic autoantibodies (ICAs)
- insulinoma-associated-2 autoantibodies (IA-2As)
- insulin autoantibodies (IAAs), which are more common in children than adults

All these tests are done through a simple blood test. It's not a need to prepare for fasting. A healthcare professional will take blood from a vein in your arm and send it to a

laboratory for analysis. If GAD or any of the other autoantibodies are found, it means you most likely have type 1 diabetes. If no GAD or other autoantibodies are found, you probably have type 2.

Serum micro RNA - 126 for early diagnosis of proliferative diabetic retinopathy⁽⁵⁾

Serum miR-126 can serve as a non-invasive biomarker for screening retinal endothelial injury and early diagnosis PDR. The serum content of miR-126 declined as the damage degree in the retina. However, one single biomarker is not enough sensitive or specific on its own for diagnosis and prediction of disease. Thus, joint detection of several markers may increase specificity or diagnostic ability.

1, 5-anhydroglucitol-novel serum marker for screening diabetes mellitus⁽⁶⁾

1, 5- Anhydroglucitol is a reduced form of glucopyranose lacking a hydroxyl group. Usually it is present in human cerebrospinal fluid and plasma. The plasma concentration of 1, 5- Anhydroglucitol varies within a shortened range in healthy individuals and significantly depreciated in patients with either type-I or type-II diabetes mellitus. Decreased 1, 5- Anhydroglucitol is specifically associated with diabetes and uremia.

Glycated CD59 - novel biomarker for screening gestational diabetes⁽⁷⁾

CD59 was described as a protein which stands as an inhibitor of the complement system. The protein was inactivated by high glucose in case of diabetes which are made to form glycated CD59. Subsequently inactivation of CD59 causes decrease in protective effect and endorse complement mediated damage. Further the process leading to the complications of diabetes such nephropathy, neuropathy and retinopathy. The pGCD59 measurement during weeks 24-28 identifies pregnancy-induced glucose intolerance with high sensitivity and specificity and can potentially identify the risk for LGA.

Aptamers – a novel diagnostic tool for diabetes mellitus⁽⁸⁾

Aptamers are short single-stranded DNA or RNA oligonucleotides that can selectively bind to small molecular ligands or protein targets with high affinity and specificity, by acquiring unique three-dimensional structures. Aptamers have the advantage of being highly specific, relatively small in size, non-immunogenic and can be easily stabilized by chemical modifications, thus allowing expansion of their diagnostic and therapeutic potential. Since the invention of aptamers in the early 1990s, great efforts have been made to make them clinically relevant for diseases like macular degeneration, cancer, thrombosis, diabetes mellitus and inflammatory

diseases. Furthermore, owing to the aforementioned advantages and unique adaptability of aptamers to point-of-care platforms, aptamer technology has created a stable niche in the field of in vitro diagnostics by enhancing the speed and accuracy of the diagnoses. Example given below is under clinical trial.

Aptamer: Pegaptanib sodium/Macugen

Company: OSI Pharmaceuticals/ Pfizer

Target: VEGF₁₆₅

Equilibrium dissociation constant (K_d): 200 Pm

Indication: - AMD (US FDA-approved for this indication)

- Proliferative diabetic retinopathy

- Diabetic macular edema

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