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Opinion

# Potential Scope of Vibrational Spectroscopy in Gestational Diabetes Mellitus

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O'Sullivan first proposed the definition of Gestational diabetes mellitus (GDM) as 'Carbohydrate intolerance of variable severity with onset or first recognition during pregnancy' [1]. The most recent definition of GDM is by American Diabetes Association (2017) is known as 'diabetes diagnosed in second or third trimester of pregnancy that was not clearly overt diabetes prior to gestation' [2]. The definition of GDM continues to be updated reveals the uncertainties with respect it to be defined as a specific disease entity which brings the high requirement of a standardized definition to diagnose GDM. Even though many definitions and diagnostic criteria's had been developed the question however, is which diagnostic criteria, and treatment modalities can be used to differ between different ethnic groups and societies.

According to International Diabetic Federation (IDF) Atlas from 2015, there were 415 million adults between the range of 20 - 79 years with diabetes globally. While, the global prevalence of diabetes was 4% in 1995 which might increase up to 5.4% by the coming year 2025 which will make it 642 million by the year 2040. 193 million cases are undiagnosed amongst all. Moreover, in the same year of 2040, diagnosed individual in developed countries will increase from 62% to almost 75%. The differences in prevalence and its recurrence rates reflects dissimilarities among populations and the reason also is lack of consensus regarding screening.

There are no standardized consensus criteria for the screening of diagnosis of GDM. Many different screening procedures and diagnostic criteria have been used over time worldwide and still controversies continue to exist in this field. American Diabetes Association (ADA) recommended the selective screening of high risk population. But over the past few years studies have proved that universal screening for diagnosis of GDM improved maternal and neonatal health and detected more cases. American Diabetes Association (ADA) recommended the selective screening of high risk population. Universal screening can be done using random plasma glucose tests or oral glucose tolerance tests (OGTT). Women should undergo screening in 1st trimester of pregnancy if they at high risk of developing GDM, afterwards the test should be repeated at 24 - 28 weeks of gestational week. Women who are at high risk they have these common factors such as obesity, high age, multiparous, positive history of diabetes, hypertension, multiple pregnancies, or she is from high risk ethnicity i.e. African, Asian, Hispanic, or Native American). Commonly used guidelines for the diagnosis of GDM was given by World Health Organization [3]. The International Association of the Diabetes and Pregnancy Study Groups (IADPSG) in which the standardized 75g OGTT is recommended by the IADPSG for the universal screening of women between gestational weeks 24 - 28. IADPSG diagnostic thresholds were accepted in 2015 by European Board and College of Obstetrics and Gynecology and Swedish National Board of Health and Welfare. Whereas, the American College of Obstetrics and Gynecology still uses the ADA criteria with 2-step procedure and other parts of Europe, WHO and IADPSG guidelines are being used.

Spectroscopy has emerged to be the major tool for biomedical applications and has made tremendous progress in the field of clinical evaluation. These techniques have not been much explored in the field of obstetrics and diabetes. There are several spectroscopic techniques employed in clinical field such as Raman spectroscopy, Fourier Transform Infrared spectroscopy (FTIR), Elastic Scattering spectroscopy (ESS) and Fluorescent spectroscopy (FS), nuclear magnetic resonance (NMR) spectroscopy [4,5]. All of these techniques, offer biochemical information non-invasively, which provides the diagnostic significance. Spectral data can be collected within seconds which leads to quick detection and multidimensional data, data can be collected from vital organs where surgery is contraindicated.

The emerging field of vibrational spectroscopy for the study of human biofluids has the potential to offer non-invasive diagnosis and monitoring of human diseases with great accuracy and precision [6]. In theory, any human biofluid such as sputum, saliva, tears, urine and semen can be analyzed using vibrational spectroscopic techniques [6,7]. Vibrational spectroscopy can provide key information about the molecular properties of a sample without destroying or altering it [8-10]. Since the molecular features of proteins, carbohydrates, nucleic acids, lipids, and metabolites will vary depending on the nature and composition of the analysed sample, this information will be unique to that sample behaving as a molecular fingerprint. The systematic and comprehensive comparison of molecular fingerprints between subjects with a specific pathology and their healthy counterparts is likely to highlight key differences which may have clinical potential as diagnostic and/or prognostic markers of disease. Further exploration of several spectroscopy techniques in the diagnosis of GDM is still required. Biological samples of different forms with a diverse range of spectroscopic analytical platform to detect various biomarkers through spectroscopic techniques in larger, prospective and more ethnically diverse population can be utilized in clinical practice. As we are with the support of emerging technologies advancing, comprehensive models of care with benefits with long term health outcomes for maternal and neonatal can be developed with the help of predictive and diagnostic biomarkers.

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