Genes and oral health

Human body is like an orchestra, multiple systems functioning in harmony to produce a beautiful melody. But the conductor of this orchestra is our genetic code. The boom in genetic research and technological advancements has led to the generation of abundance of scientific information. Integrating this information and technological developments into the field of oral health has opened doors to unexplored avenues in the field of dentistry, enabling us to understand the etiology of diseases more effectively and equipping clinicians with knowledge required for better diagnosis, new treatment plans and formulation of preventive strategies.

The National Institute of Dental and Craniofacial Research Genetics, U.S.A. in 2008 studied and stated that of the almost 5500 known human genetic disorders, almost 700 are craniofacial (Williams et al, 2014). Majority of these genetic disorders affect oral health either directly or indirectly. Genetic counseling enables the patient or parents to be better prepared- proper guidance, education and intervention can be given.

Different populations have different responses to a stimulus. Recent research regarding periodontitis has shown that immune response is highly dependent on genetic mechanisms, along with host environmental factors. Changes in the genes encoding cytokines can alter their expression resulting in pro- or anti-inflammatory responses. Studies have exhibited association between chronic periodontitis and epigenetic changes in genes programmed for pro-inflammatory cytokine response (Zhang et al, 2013). An association has been established between DNA methylation of pro-inflammatory mediator genes and aggressive periodontitis (Andia et al, 2010).

Orthodontic literature focuses on the amalgamation of genetic factors and environmental conditions, like forces acting on the jaws, growth and remodeling of condyles, which bring about epigenetic changes that affect gene expression. Oral-facial clefts, majorly cleft lip and cleft palate affect one in every 500 to 1000 births worldwide. It has been proven that many Mendelian syndromes are associated with clefts and certain chromosomal anomalies include clefts in the phenotype.

A genome-wide study found noticeable interactions between the following genes and pregnant mother's habits: MLLT3 and SMC2 with alcohol consumption; TBK1 and ZNF236 with maternal smoking; and BAALC with multivitamin supplementation (Marazita, 2012).

Genetic alterations during developmental phase of epithelial derivatives can lead to changes in dental tissues like tooth bud, dentin and enamel, resulting in hypodontia, pitted enamel and dentinal defects; for example mutations in genes responsible for WNT pathway lead to hypodontia and enamel hypoplasia (Wang et al, 2007). Defects in dentin lead to dentin dysplasia and dentinogenesis imperfecta. Dentin dysplasia is an autosomal dominant trait associated with molecular defects on chromosome 4q21. Dentinogenesis imperfecta is inherited as molecular defect in pro alpha chains of collagen type 1 gene on chromosome 17q.

The importance of the role of genes and its influence on oral environment is the new reality in dentistry. We are just on the tip of the iceberg. There is a world waiting to be

discovered. In this special issue on 'genes and oral health' we have brought up a collection of articles on the role of genetic changes in various dental/oral pathologies. We hope the issue will provide a comprehensive reference point for advancing research in this field.

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