INTRODUCTION

Dental caries is an epidemic encountered by the major population of the world. It affects the calcified tissues of the teeth resulting in localized chemical dissolution of the tooth surface caused by metabolic events that take place in the biofilm covering the affected area. Plaque retaining acidogenic bacteria in oral biofilm, increased frequency of carbohydrate intake, and increased frequency of exposure to dietary acids enhance the rate of caries formation.\(^1\)

Several variables play a key role during the process of transforming dental caries from a physiological process to pathology, over a period of time.\(^2\) There is lack of a definite boundary line between health and disease. There is a metabolic shift in the dynamic process of caries formation where the demineralization outweighs the remineralization. The subsurface demineralization is caused when the acid ions penetrate deep into the dentine porosities\(^3\) leading to microscopic changes in the tooth.\(^4\)

Prevalence of dental caries was observed way back in the preneolithic humans with 1.4% and 12.1% carious teeth. A marked rise of 25% in caries prevalence was observed during the fourteenth and fifteenth century; this is ascribed to the increase in sucrose consumption.\(^5\) A significant decline in caries prevalence has been noted since 1970 until the recent survey conducted by national health and nutrition during 1999-2004. This change in the world wide ubiquitous nature of dental caries can be attributed to the caries preventive measures such as community water fluoridation, use of fluoride tooth pastes and dietary restriction. Several studies have been conducted to estimate the status of dental caries in Indian population. In India the prevalence of dental caries in 1940 was 55.5%, and in 1960 it was reported to be 68%.\(^6\) It has been observed that since last two decades increase in caries prevalence and its severity has been observed in urban and cosmopolitan population. In 2004 National Health Survey reported that prevalence of dental caries throughout India was 51.9% in 5-year-old children, 53.8% in 12-year-old children and 63.1% in 15-year-old teenagers.\(^7\)
Decreased insulin production by pancreas results in type 1 diabetes mellitus or body cells exhibiting resistance to effects of insulin results in type 2 diabetes mellitus. Specific type of diabetes such as those associated with gene defects of pancreatic beta cell function, diseases of exocrine pancreas, and drug induced diabetes fit into the minor categories of diabetes. Classical symptoms such as polyuria, polyphagia and polydypsia are observed in diabetic patients. Acute complications like diabetic ketoacidosis, non ketotic hyperosmolar coma and long term complications like nephropathy, retinopathy, and gangrene are associated in chronic diabetic patients where proper treatment protocol is not followed.

Several risk factors such as increasing age, genetic and environmental factors are associated with type 2 diabetes mellitus, which is the most prevalent type of diabetes. Out of these genetics play a major role in type 2 diabetes mellitus. Numerous factors such as obesity, lack of physical activity, stress and increased consumption of sugar-sweetened drinks in excess influence the risk of type 2 diabetes mellitus.

Reduced insulin sensitivity is the abnormality detected in the early stage of type 2 diabetes mellitus, where the high blood sugar levels are altered with medications or reducing the amount of glucose produced by the liver. According to the national survey for diabetics conducted in six major cities in 2000 a 12.1% prevalence of diabetes was observed among the urban Indians. Recently international diabetic federation assessed that 366 million people were affected by type 2 diabetes mellitus in 2011 and they computed that this disease may preponderantly increase globally, to 552 million by 2030. In the total population affected by type 2 diabetes mellitus 80% of them belong to low income countries. In India it has been observed that Type 2 diabetes mellitus was 4-6 times more preponderant in urban population than compared to the rural population. Previous studies had revealed a high risk of dental caries in patients with type 2 diabetes mellitus which can be attributed primarily to hyposalivation which results in decreased buffering activity thus affecting the remineralization of tooth structure. Apart from the above mentioned factors, increased concentration of glucose in the blood, poor oral hygiene favored the growth of oral bacteria thus increasing the risk for caries.

Genetics play a substantial role in caries susceptibility with the heritability ranging from 40% to 60%. Genotypic, phenotypic and environmental influences on caries susceptibility were
evident from the Vipeholm study, where individuals exhibited resistance to caries despite of being on high carbohydrate diet. Studies on twin pairs showed that Monozygotic twins exhibited greater similarity in caries experience than the dizygotic twins.

Taste perception in an individual is mediated by type I, type II and type III taste receptor cells. These taste receptor cells are located in taste buds. Type II taste receptor cells express sweet, bitter and umami taste. Sweet receptors in Type II taste receptor cells are formed by combination of T1R2 and T1R3 proteins. TAS1R2 and TAS1R3 are the genes associated with these proteins. It was observed from the experiments that any modification in the DNA sequence of genes TAS1R2 and TAS1R3 resulted in small changes in specific amino acid sequence that led to differences in response to sweeteners. The individual differences in psychophysical responses to sweeteners, suggest that the alleles of these genes influence sweet perception. An association between variations in the TAS2R38 and TAS1R2 genes in the primary and the mixed dentition was demonstrated by Wendell et al., in 2010. Ile191Val (rs35874116), and Ser9Cys (rs9701796) are the two common polymorphisms of the TAS1R2 gene that result in amino acid substitutions.

GLUT2 gene is primarily involved in glucose homeostasis, belongs to facilitative glucose transport protein family. This gene is found on chromosome 3 in humans and it is coded by SLC2a2 gene. Pancreas, liver, small intestine, kidney and brain are the various organs in which GLUT2 gene is expressed. Substitution of Threonine for isoleucine Amino acid at codon 110 is observed when a single nucleotide polymorphism (rs5400) occurs in the GLUT2 gene. Highest prevalence of GLUT2 gene polymorphism (rs5400) was observed in Caucasians. Eny et al in 2010 had reported that a variation in individual preferences for sugar containing foods was due to the variations in the GLUT2 gene.

It was observed that caries risk was high in Caucasians individuals where both the TAS1R2 and GLUT2 genotypes present individually and in combination. Holla et al in 2015 had reported that increased risk for caries was observed for specific Ile allele of rs 5400 GLUT2 and Val allele of rs 35874116 TAS1R2 genes. Robino A, in 2015 observed that high risk for dental caries is associated with preferences to food and polymorphisms of glut2 and tas1r2 genes.