INTRODUCTION

Periodontal disease (PD) in diabetic patients is described as the 6th complication of diabetes. We have previously shown that diabetes increases dental caries, and carious inflammation might have a strong effect on the adjacent periodontal tissue in diabetic rodent models. However, the possibility that hyperglycemia may induce PD in diabetic animals could not be completely eliminated. The goal of this study was to confirm the presence of PD in diabetic animal models by preventing carious inflammation with fluoride administration. F344 rats injected with alloxan (type-1 diabetic model) and db/db mice (type-2 diabetic model) were given either tap water alone or tap water containing fluoride. A cariostatic effect of fluoride was evident in the diabetic animals. Meanwhile, fluoride treatment drastically attenuated periodontal inflammation in addition to preventing dental caries. Furthermore, with fluoride treatment, periodontitis was notably nonexistent in the periodontal tissue surrounding the normal molars, whereas the caries forming process was clearly observed in the teeth that were enveloped with persistent periodontitis, suggesting that enhanced periodontal inflammation might have been derived from the dental caries in the diabetic rodents rather than from the PD. In conclusion, long-term hyperglycemia naturally induces dental caries but not PD in type-1 and type-2 diabetic rodents.

Diabetes is a common disease with concomitant oral manifestations that impact dental care. The purpose of this review is to summarize the prevalence, signs, symptoms, diagnosis and treatment of diabetes, as well as dental treatment considerations for the patient with diabetes.

This Research book to focus carry on to evaluate the possible protective role of macro-minerals elements like adequate level of Calcium, Phosphate, fluoride & pH and alkaline phosphatase levels in dental cavity of diabetic adults. To investigate the oral parameters that influence the caries risk and risk of developing periodontal disease in children with PKU and type 1 diabetes. The parameters to be assessed were the dental and oral hygiene status and oral microorganisms in children with diabetes, PKU and in healthy children.

The compared the periodontal and caries experience of young patients with insulin-dependent diabetes mellitus (IDDM) with a non-diabetic population of the same age. The plaque scores of children with IDDM were statistically higher. The caries experience of a child with closely monitored IDDM and a family history of diabetes was significantly lower than that of a child with IDDM and no such family history, even though the gingival and plaque indexes of both children were the same.

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**ABSTRACT**
The present study aims to provide an insight into the Oral health suffering from metabolic diseases especially Diabetes type 1in relation of macro-minerals elements. At the same time it seeks to answer questions on whether the dietary regulations of the children have an effect on their oral health and whether there is an alteration in their oral microflora, putting the children at a higher or lower risk for developing dental caries and periodontal disease. Diabetes is a metabolic disorder i.e. principally classified into type 1 and type 2 diabetes. Traditionally, children suffering from type 1 diabetes had to follow a diet restricted in carbohydrates In order to maintain normal blood sugar levels. The intake of carbohydrates was aligned with the insulin regime. Advancements insulin therapy regimes have led to the relaxation of dietary restrictions & type 1 diabetics are now able to follow a diet. And also the results of the present research for children’s showed that the mean DMFT index value in the group of children’s suffering from PKU was statistically significantly higher than in the healthy children and the diabetic children. Thus the study is of great practical importance.

In Phenylketonuria, the metabolic disorder is the inability to convert a substance called phenylalanine to tyrosine due to deficiency of an enzyme called phenylalanine hydroxylase.

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Author can be concluded in the book for adults that the adequate level of calcium, phosphate and fluoride is responsible for the significant deposition of these minerals in plaque which greatly reduces the developmental caries in the adjacent enamel, i.e. the diabetic patients are more prone to develop dental caries with calcium, phosphorus levels decreases and alkaline phophasate level increases. But in diabetic females with dental caries serum phosphorus levels are very low in comparison to diabetic male. And also the results of the present research for children’s showed that the mean dmfs index value in the group of children’s suffering from PKU was statistically significantly higher than in the healthy children and the diabetic children. Thus the study shows in book is of great practical importance.

In Phenylketonuria, the metabolic disorder is the inability to convert a substance called phenylalanine to tyrosine due to deficiency of an enzyme called phenylalanine hydroxylase.

**The defect in phenylketonuria can be represented as**

![Diagram]

PKU induced mental retardation can be prevented by a phenylalanine restricted diet, the special diet is difficult to obtain in India, and is expensive. It is not surprising therefore, that in India, most parents having an affected child desire prenatal diagnosis in the next pregnancy. However, prenatal diagnosis is not possible by PAH enzyme assay because the enzyme is only expressed in the liver. Prenatal diagnosis of PKU is feasible only by molecular studies. (Sudha 2005)

The accumulation of phenylalanine in the blood and brain causing disabilities. In order to keep the ingestion of phenylalanine to a minimum, children with PKU follow a special low protein diet. At the same time, their diet is rich in carbohydrates and the phenylalanine -free formula drinks have a high pH (Kilpatrick 1999). The frequency of ingestion of these carbohydrates is high and therefore, the risk for the development of caries in children suffering from PKU is considered to be high. Diabetes is another metabolic disorder, caused due to defective insulin secretion and action resulting in abnormally high blood glucose levels.

Several studies have made diabetes and oral health their subject to elucidate the impact of both on each other. A large portion of these studies have, however been conducted on type 2 diabetic patients. Studies on children have documented inconsistent results which may be due to the varying susceptibility of the patients and the multifactorial nature of both diseases (Karjalainen, 2000)

In this research book to aims to provide an insight into the oral status of children& adults suffering from two different metabolic diseases. At the same time it seeks to answer questions on whether the dietary regulations of the children have an effect on their dental health and whether there is an alteration in their oral microflora, putting the children at a higher or lower risk for developing dental caries and periodontal disease. Diabetes is a metabolic disorder i.e. principally classified into type 1 and type 2 diabetes. Traditionally, children suffering from type 1 diabetes had to follow a diet restricted in carbohydrates (Goteiner1997) in order to maintain normal blood sugar levels. The intake of carbohydrates was aligned with the insulin regime. Advancements insulin therapy regimes have led to the relaxation of dietary restrictions &type 1 diabetics are now able to follow a diet quite similar to normal healthy individuals (Ciglar 2002) The percentage of the population & diabetes is approximately 8-12%. The fraction is increasing with age, reported.

Both dental cavity (periodontitis) and diabetes mellitus are frequent chronic diseases and generate enormous costs for the public health care system. Numerous studies, review articles and meta- analyses indicated a mutual influence between periodontitis and diabetes mellitus. The mechanisms, whereby diabetes may negatively influence periodontal health, are primarily based on the impaired local immune defense and a reduced renewal of the periodontal tissues. Moreover, higher levels of advanced glycation end products (AGE) can be found in the dental cavity of diabetics compared to non -diabetic subjects. The interaction between AGEs and collagen generates highly stable collagen macromolecules, that are resistant to physiologic enzymatic degradation. Hence, the renewal of all periodontal tissues is effectively compromised in diabetic subjects, especially when glycemic control is poor. These phenomena explain in part why diabetic patients are three times more likely to develop periodontitis than non-diabetic subjects.

The role of serum calcium, phosphate and fluoride& pH in dental caries has been the point of interest since the mid of this century by many oral hygienist in the field of oral biochemistry. The early work of Stephan regarding the estimation of salivary pH had showed that the pH of saliva remained below the critical level of 5.5 in dental caries of diabetic patients, than the caries free people. Another study carried out by Abelson and Mandel demonstrated that the saliva exert its major influence on caries initiation by means of plaque formation rather than by direct contact on the tooth surface, they showed that plaque pH fall was greater in caries susceptible subjects. However this study did not show any significant change in the blood pH with the progression of disease.
The study is carry on by previous workers revealed that the calcium ions are present normally in dental plaque bound to matrix and other proteins attracting phosphate and fluoride as counter ion, other phosphate and fluoride occurs intracellularly. All three ions occur as an inorganic mineral in serum and are in continuous exchange phase with the saliva over the dental plaque. This is responsible for the “pool” or “reservoir” of calcium, phosphate and fluoride in dental plaque and also maintains their saturation. These observations are quite identical with our study as levels of serum calcium, phosphate and fluoride are significantly low in dental caries patient in comparison to the control.

DISCUSSION

The development of dental caries depends on interrelationships among the tooth surface, dietary carbohydrates, and specific oral bacteria. Organic acids produced by bacterial fermentation of dietary carbohydrates reduce the pH of dental plaque adjacent to the tooth to a point where demineralization occurs. The initial demineralization appears as an opaque white spot lesion on the enamel, and with progressive loss of tooth mineral, cavities of the tooth occurs (Fig. 2).

Clinical Manifestations

Dental caries of the primary dentition usually begins in the pits and fissures. Small lesions may be difficult to diagnose by visual inspection, but larger lesions are evident as darkened or cavitated lesions on the tooth surfaces (Fig. 3). Rampant dental caries in infants and toddlers, referred to as early childhood caries (ECC), is the result of a child colonized early with cariogenic bacteria and the frequent ingestion of sugar, either in the bottle or in solid foods. The carious process in this situation is initiated earlier and consequently can affect the maxillary incisors first and then progress to the molars as they erupt.

Figure 3 Rampant caries in a 3 yr old child. Note darkened and cavities lesions on the fissure surfaces of mandibular molars.

The prevalence of ECC is 30-50% in children from low socioeconomic backgrounds and as high as 70% in some native another groups. Besides high frequency of sugar consumption and colonization with cariogenic bacteria, other enabling factors include low socioeconomic status of the family, other family member with carious teeth, recent immigrant status of the child, and the visual presence of dental plaque on the child’s teeth. Children who develop caries at a young age are known to be at high risk for developing further caries as they get older. Therefore, the appropriate prevention of early childhood caries can result in the elimination of major dental problems in toddlers and less decay in later childhood.
Literature Review

The ISPAD (International Society for Pediatric and Adolescent Diabetes) has defined Diabetes as follows:

“Diabetes is a group of metabolic diseases characterized by chronic hyperglycemia resulting from defects in insulin secretion, insulin action, or both. The abnormalities in carbohydrate, fat, and protein metabolism that are found in diabetes are due to deficient action of insulin on target tissues. If ketones are present in blood or urine, treatment is urgent, because ketoacidosis can develop rapidly.” (Craig et al., 2009)

Patients with hyperglycemia present with the symptoms of polyuria, polydipsia, blurred vision and weight loss associated with polyphagia. Chronic hyperglycemia may be accompanied by impairment of growth and susceptibility to certain infections. Inadequacy due impairment of insulin secretion and defects in insulin action may exist in the same patient, making it difficult to define which of the above is truly responsible for the hyperglycemia.

Diabetes can be mainly classified in type 1 and type 2 diabetes. Further classification of diabetes includes cases of hyperglycemia due to genetic defects of the β-cells or in insulin action, endocrinopathies, infections, induced by drugs or chemicals, pancreatic diseases, associated with syndromes and gestational diabetes.

Heterogeneous epidemiological data about the prevalence of periodontal diseases are available in the dental literature. Due to the advanced age of the subjects examined in the present study, the following epidemiological data predominantly focus on the prevalence of chronic periodontitis in adults and older subjects.

Cariology is the study of dental caries. Dental cavity is a multifactorial disease, which has affected people throughout the ages. Many constituent of serum and saliva, both organic and inorganic have potentially protective role. These include calcium, phosphate, fluoride ions and bicarbonate buffer systems. Epidemiological studies have supported the view that raised level of calcium, phosphate, and Fluoride in plaque might inhibit dental caries. It is commonly thought that the organic acid produced in dental plaque is responsible for caries, but this is only partly true because it is a complex effect of pH, calcium, phosphate and fluoride, which brought about minerals dissolution. In theory, continuous saturation of plaque fluid with mineral ions should completely over come the harmful effect of plaque pH depressions, and thus should be more effective than fluoride therapy. In low concentration, fluoride alone only partially inhibits the net dissolution of enamel and the production of acid by plaque organisms, while demineralization requires the presence of calcium and phosphate .The present study is done to estimate serum calcium, phosphate, and fluoride in the patients of dental caries in diabetes and to see and compare their level with the severity of disease and control.

Another aims of study to provide an insight into the oral status of children suffering from two different metabolic diseases. At the same time it seeks to answer questions on whether the dietary regulations of the children have an effect on their dental health and whether there is an alteration in their oral microflora, putting the children at a higher or lower risk for developing dental caries and periodontal disease.

A number of studies have been dedicated to the investigation of oral health in diabetics. The majority of these studies have been focused on the relationship between periodontal disease and diabetes and fewer on dental caries and diabetes. Although the risk of developing periodontal disease in diabetics is well established, the association of dental caries and diabetes is still debated. It is, however, difficult to interpret the significance of the results in relation to children as a large amount of the studies regarding oral health in diabetics have been carried out with type 2 diabetic adult patients. In 1999, Kilpatrick et al. evaluated the oral health of forty children with PKU and the erosive potential of 5 amino acid supplements commonly prescribed in their management. They found no significant difference in the level of dental caries between the PKU children and the healthy children. The PKU children did, however, show more signs of tooth wear. Supporting this finding, the study did reveal that the titratable acidity of the flavoured supplements was significantly.

Diabetes and dental care: Guide to a healthy mouth

What do brushing and flossing have to do with diabetes? Plenty. If you have diabetes, here’s why dental care matters-and how to take care of your teeth and gums.

When you have diabetes, high blood sugar can take a toll on your entire body-including your teeth and gums. The good news? Prevention is in your hands. Learn what you're up against, and then take charge of your dental health.

Cavities and gum disease

Whether you have type 1 diabetes or type 2 diabetes, managing your blood sugar level is key. The higher your blood sugar level, the higher your risk of:

Tooth decay (cavities). Your mouth naturally contains many types of bacteria. When starchy and sweet foods and beverages interact with these bacteria, a sticky film known as plaque forms on your teeth. The acids in plaque attack the surfaces of your teeth (enamel and dentin). This can lead to cavities.

The higher your blood sugar level, the greater the supply of sugars and starchy foods and the more crevice becoming food away at your teeth.

Early gum disease (gingivitis). Diabetes reduces your ability to fight bacteria. If you don't remove plaque with regular brushing and flossing, it'll harden under your gum line into a substance called tartar (calculus). The longer plaque and tartar remain on your teeth, the more they irritate the gingiva - the part of your gums around the base of your teeth. In time, your gums become swollen and bleed easily. This is gingivitis.
Advanced gum disease (periodontitis). Left untreated, gingivitis can lead to a more serious infection called periodontitis, which destroys the soft tissue and bone that support your teeth. Eventually, periodontitis causes your gums and jawbone to pull away from your teeth, which in turn causes your teeth to loosen and possibly fall out.

Periodontitis tends to be more severe among people who have diabetes because diabetes lowers the ability to resist infection and slows healing. An infection such as periodontitis may also cause your blood sugar level to rise, which in turn makes your diabetes more difficult to control. Preventing and treating periodontitis can help improve blood sugar control.

Proper dental care
To help prevent damage to your teeth and gums, take diabetes and dental care seriously:

Make a commitment to manage your diabetes. Monitor your blood sugar level, and follow your doctor’s instructions for keeping your blood sugar level within your target range. The better you control your blood sugar level, the less likely you are to develop gingivitis and other dental problems.

Brush your teeth at least twice a day. Brush in the morning, at night and, ideally, after meals and snacks. Use a soft-bristled toothbrush and toothpaste that contains fluoride. Avoid vigorous or harsh scrubbing, which can irritate your gums. Consider using an electric toothbrush, especially if you have arthritis or other problems that make it difficult to brush well. Get a new toothbrush at least every three months.

Floss your teeth at least once a day. Flossing helps remove plaque between your teeth and under your gum line. If you have trouble getting floss through your teeth, use the waxed variety. If it’s hard to manipulate the floss, use a floss holder.

Schedule regular dental visits. Visit your dentist at least twice a year for professional cleanings and checkups.

Make sure your dentist knows you have diabetes. Every time you visit your dentist, remind him or her that you have diabetes. Make sure your dentist has contact information for your doctor who helps you manage your diabetes.

Look for early signs of gum disease. Report any signs of gum disease - including redness, swelling and bleeding gums-to your dentist. Also mention any other signs and symptoms, such as dry mouth, loose teeth or mouth pain.

Don’t smoke. Smoking increases the risk of serious diabetes complications, including gum disease. If you smoke, ask your doctor about options to help you quit.

Managing diabetes is a lifelong commitment, and that includes proper dental care. Your efforts will be rewarded with a lifetime of healthy teeth and gums.

Practice Implications
Dental practitioners will be treating more patients with diabetes in the future, and this article provides an overview of the systemic and oral aspects of the disease that impact dental treatment. Diabetes mellitus is a syndrome of abnormal carbohydrate, fat and protein metabolism that results in acute and chronic complications due to the absolute or relative lack of insulin. There are three general categories of diabetes: type 1, which results from an absolute insulin deficiency; type 2, which is the result of insulin resistance and an insulin secretor defect; and gestational, a condition of abnormal glucose tolerance during pregnancy.

Diabetes develops in people of all ages, although in greater frequency in our countries and prevalence have increased dramatically over the past several decades. Diagnosis is made on the basis of a host of systemic and oral signs and symptoms, including gingivitis and periodontitis recurrent oral fungal infections and impaired wound healing.

Approximately one-third of adults with diabetes in our countries are undiagnosed, and preventive care among patients with diabetes falls below national health objective standards. Therefore, dental professionals can play an important role in diagnosing and managing patients with diabetes. Furthermore, because poorly controlled diabetes leads to significant morbidity and mortality, dentists can counsel their patients with diabetes about improving glucose regulation, maintaining oral and nutritional health, performing daily glucose monitoring tests and seeing medical professionals for routine care.

Owing to the increasing longevity of the Indian population and the growing prevalence of diabetes, as well as the increased effectiveness of diagnostic and therapeutic protocols, researchers have predicted that dental practitioners will be treating more patients with this disease.

Systemic Aspects of Diabetes Signs and symptoms
The onset of symptoms is rapid in type 1 diabetes, and includes the classic triad of polyphagia, polydipsia and polyuria, as well as weight loss, irritability, drowsiness and fatigue. Symptoms of type 2 diabetes develop more slowly, and frequently without the classic triad; rather, these patients may be obese and may
Insulin pumps provide a continuous (eight to 12 hours) and long-term (six to 12 hours), regular therapy for patients with both type 1 and type 2 diabetes. Dentists should be familiar with the medications used for medical therapy alone or in combination with oral hypoglycemic agents. Weakness, sweating, mental confusion, in coordination and trembling occur when a person's serum glucose level falls below 50 to 70 milligrams per deciliter, and symptoms become severe (loss of consciousness and convulsions) when levels fall below 40 mg/dL.

**Diagnosis**

According to the Diabetes Association's diagnostic criteria by WHO for diabetes require a fasting blood glucose level of 126 mg/dL or greater. The measurement of glycosylated hemoglobin, or HbA1c, is a good measure of long-term (six to 12 weeks) glucose regulation. For people with diabetes, the goal is to maintain HbA1c levels below 7 percent (normal levels fall between 4 and 6 percent). HbA1c levels above 9 percent reflect poorly controlled diabetes, and indicate the need for aggressive diabetic control.

**Treatment**

**Diabetes is not a curable disease and therapy has four goals**

- to normalize blood glucose levels;
- to prevent acute complications and eliminate symptoms;
- to maintain ideal body weight;
- to prevent or minimize chronic complications.

Oral hypoglycemic medications depend on functioning pancreatic beta cells to stimulate insulin secretion and, therefore, are used to treat many patients with type 2 diabetes. Insulin is required for patients with type 1 diabetes, as well as for patients with type 2 diabetes who do not respond to dietary therapy alone or in combination with oral hypoglycemic therapy. Diet and physical exercise are a necessary component of therapy for patients with both type 1 and type 2 diabetes. Dentists should be familiar with the medications used for diabetes; updated lists of common therapies are available. Oral hypoglycemic agents include sulfonylureas (which enhance insulin secretion), biguanides (which reduce hepatic glucose production), alpha-glucosidase inhibitors (which delay glucose absorption) and thiazolidinediones (which enhance insulin sensitivity). Insulin is available in short-acting (one to 1½ hours), regular-acting (four to six hours), intermediate-acting (eight to 12 hours) and long-acting (24-36 hours) formulations. Insulin pumps provide a continuous burst of insulin to help control serum glucose levels.

Home glucose monitoring is recommended several times daily to help regulate rapid fluxes in blood sugar levels due to diet, medications and physical and psychological stresses. Many tools are available to help people with diabetes, including home-based urine and blood tests and glucometers. Patients must undergo regular examinations by physicians to monitor triglyceride, fasting glucose and HbA1c levels. Dentists should document their patients’ most recent homebased glucose and laboratory test results, and monitor blood pressure levels in the dental office to assist in oral health supervision.

Nutritional supervision is a critical component of diabetes management, and dentists can assist in this endeavor. Risk factors for impaired nutritional intake include gingivitis and periodontitis, oral microbial infections, poorly fitting or lack of removable prostheses, dysphagia and salivary dysfunction. A realistic nutritional plan that includes regular oral hygiene and requisite dental treatment can help patients maintain good blood glucose control and nutritional status. Dental treatment considerations for the patient with diabetes

**Antibiotic coverage**

Patients with poorly controlled diabetes are at risk of developing oral complications because of their susceptibility to infection and sequelae and likely will require supplemental antibiotic therapy. Anticipation of dentoalveolar surgery (involving mucosa and bone) with antibiotic coverage may help prevent impaired and delayed wound healing. Orofacial infections require close monitoring. Cultures should be performed for acute oral infections, antibiotic therapy initiated and surgical therapies contemplated if appropriate (for example, incision and drainage, extraction, pulpectomy). In cases of poor response to the first antibiotic administered, dentists can select a more effective antibiotic based on the patient's sensitivity test results.

**Adjustment of insulin or hypoglycemic**

Most forms of dental therapy should not interfere with the medical control of diabetes. However, dentoalveolar surgery, orofacial infections and the stress of dental procedures can increase serum glucose levels and metabolic insulin requirements. Therefore, dentists must consider modifying medical therapy in consultation with the patient's physicians. For example, patients whose condition is controlled with insulin usually will require increased insulin dosages in the presence of an acute oral infection.

**Summary**

Dental caries, also known as tooth decay or a cavity, is an infection, bacterial in origin, that causes demineralization and destruction of the hard tissues (enamel, dentin and cementum), usually by production of acid by bacterial fermentation of the food debris accumulated on the tooth surface. If demineralization exceeds saliva and other remineralization factors such as from calcium and fluoridated toothpastes, these hard tissues progressively break down, producing dental caries (cavities, holes in the teeth). The bacteria most responsible for dental cavities are the mutants streptococci, most prominently Streptococcus mutans and Streptococcus sobrinus, and lactobacilli. If left untreated, the disease can lead to pain, tooth loss and infection. Today, caries remain one of the most common diseases throughout the world. The systemic effects of...
It is often essential for children suffering from metabolic diseases to follow a strict diet to keep the disorder under check and to be able to develop and function normally. Phenylketonuria (PKU) is a metabolic disorder in which the patients present with an absence or deficiency of the enzyme phenylalanine hydroxylase which is essential to metabolize the amino acid phenylalanine into the amino acid tyrosine. Uncontrolled, the disease can lead to the accumulation of phenylalanine in the blood and brain causing disabilities. In order to keep the ingestion of phenylalanine to a minimum, children with PKU follow a special low protein diet. At the same time, their diet is rich in carbohydrates and the phenylalanine -free formula drinks have a high pH. The frequency of ingestion of these carbohydrates is high and therefore, the risk for the development of caries in children suffering from PKU is considered to be high.

Diabetes mellitus affects people of all ages, and its prevalence has been increasing. Providing safe and effective oral medical care for patients with diabetes requires an understanding of the disease and familiarity with its oral manifestations. The goal of therapy is to promote oral health in patients with diabetes, to help prevent and diagnose diabetes in dental patients receiving routine stomatological care and to enhance the quality of life for patients with this incurable disease.

Safely managing the patient with diabetes requires effective communication among multiple health care providers. Dentists must be familiar with techniques to diagnose, treat and prevent stomatological disorders in patients with diabetes. The results of the present research book showed that the mean dmfs index value in the group of children suffering from PKU was statistically significantly higher than in the healthy children and the diabetic children.

Our study quite clearly gives the information that there is significant fall in serum calcium, phosphates and fluoride as the disease process advances.

**About this Research Book**

This book is a well-illustrated and comprehensive guide to the etiology, clinical manifestations, diagnosis, clinical management and prevention of dental caries. Current challenging problems in the field are analyzed and the latest research findings, presented. After an introductory chapter on tooth development, the relationships of biofilm and saliva to dental caries and the significance of the balance between demineralization and remineralization for the development of carious lesions are discussed. Subsequent chapters address the state of the art in diagnosis and treatment, the implications of disease burden for prevention and the association between systemic diseases and dental caries. Dental Caries: Principles and Management is intended for dental school students, practicing dentists and researchers in dentistry.

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