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‘CARBOHYDRATE METABOLISM’ & PROSTHODONTICS- A NARRATIVE REVIEW

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ABSTRACT:

Deficiencies in the metabolism of carbohydrates can result in a variety of oral health problems that directly affect the course of prosthodontic treatment. Disorders related to carbohydrate metabolism, such as diabetes mellitus, glycogen storage diseases, galactosemia, and insulin resistance, have significant implications for both systemic and oral health. These disorders can complicate prosthodontic treatments by affecting periodontal health, wound healing, and the stability of prosthetic devices. Understanding and managing these metabolic disorders are crucial for ensuring successful outcomes in prosthodontics. As such very less literature is available on the role of Carbohydrate metabolism on Prosthodontic treatment. Hence this narrative review aimed to discuss the role of Carbohydrate metabolism, its significance in dental and general health and its effect on prosthodontic treatments.

Key Words: Carbohydrate Metabolism; Glycolysis; Prosthodontic Treatment; Disorders related to Carbohydrate Metabolism.

INTRODUCTION:

One of the three macronutrients in the human diet, along with protein and fat, is carbohydrates. Atoms of carbon, hydrogen, and oxygen make up these molecules. Both simple and complex sugars belong to the family of carbohydrates. Polysaccharides are molecules that store energy. [1] Carbs are broken down into simple, soluble sugars during digestion, and these sugars can pass through the intestinal wall and enter the circulatory system to be distributed throughout the body.

The process of breaking down carbohydrates starts in the mouth when salivary amylase breaks down starches. It concludes with the absorption of monosaccharides through the small intestine's epithelium. Cellular respiration starts as soon as the absorbed monosaccharides are delivered to the tissues. An essential function of carbohydrates is in the human body. They provide energy, assist in the metabolism of insulin and blood sugar, take part in the metabolism of triglycerides and cholesterol, and aid in fermentation.[2]

The term "carbohydrate metabolism" describes the set of metabolic reactions that control the body's synthesis, degradation, and conversion of carbs. The body needs these mechanisms to produce energy and keep its glucose levels stable. Glucose is the principal carbohydrate involved in metabolism, and cells use it to make ATP (adenosine triphosphate), which is the fundamental energy currency of the cell.[3]

Key Processes in Carbohydrate Metabolism: [4-6]

1.Glycolysis:

Location: cellular cytoplasm. The first stage of the metabolism of carbohydrates is called glycolysis, in which a single glucose molecule—a six-carbon sugar—is broken down into two pyruvate molecules, which are three-carbon compounds. A little amount of ATP and NADH (an additional energy carrier) are produced during this process. Since oxygen is not needed for glycolysis, it is an anaerobic process.

2.Krebs Cycle (Citric Acid Cycle):

Location: mitochondria. Once inside the mitochondria, pyruvate from glycolysis is transformed into acetyl-CoA. This goes into the Krebs cycle, where it undergoes additional breakdown to produce CO_2, ATP, NADH, and $FADH_2$ as byproducts. Because it needs oxygen to function, the Krebs cycle is an aerobic process.

3.Oxidative Phosphorylation (Electron Transport Chain):

Location: inner membrane of the mitochondria. Electrons from the Krebs cycle and glycolysis are donated to the electron transport chain by NADH and FADH2. A proton gradient is produced as electrons move through this chain, and this gradient propels the creation of ATP by ATP synthase. Most of the ATP produced by the cell is produced by this process.

4.Gluconeogenesis:

Location: Liver (and kidney to a lesser degree). This is how glucose is produced from non-carbohydrate materials like amino acids, glycerol, and lactate. When glucose levels are low, such as during fasting or vigorous activity, it is essential.

5.Glycogenesis:

Location: Liver and muscles. When there is an excess of glucose, it is stored as glycogen through the process of glycogenesis. This stored glycogen can later be converted back into glucose when needed.

6.Glycogenolysis:

Location: Liver and muscles. When the body needs glucose, glycogen stored in the liver and muscles is broken down into glucose-1-phosphate and then into glucose-6-phosphate through the process of glycogenolysis, which can enter glycolysis to provide energy.

7.Pentose Phosphate Pathway (PPP):

Location: Cytoplasm. The PPP is an alternative pathway to glycolysis, primarily involved in the production of NADPH (used in biosynthetic reactions) and ribose-5-phosphate (used in nucleotide synthesis).

Regulation of Carbohydrate Metabolism:[7]

Carbohydrate metabolism is tightly regulated by hormones:

Insulin: Promotes glucose uptake by cells, glycogenesis, and inhibits gluconeogenesis and glycogenolysis.

Glucagon: Stimulates glycogenolysis and gluconeogenesis while inhibiting glycogenesis.

Epinephrine: Increases glycogenolysis, particularly during stress.

Cortisol: Promotes gluconeogenesis during prolonged stress.

Importance of Carbohydrate metabolism: [8-10]

Carbohydrate metabolism is crucial for various physiological functions and plays a fundamental role in maintaining overall health. Here's an overview of its importance:

1. Primary Source of Energy:

The body uses carbohydrates as its primary energy source. The Krebs cycle, oxidative phosphorylation, and glycolysis break down glucose to create ATP, which drives cellular functions. Essential processes including muscular contraction, nerve impulse transmission, and active transport across cell membranes are powered by ATP, which is produced during the metabolism of carbohydrates.

2. Regulation of Blood Glucose Levels:

Stable blood glucose levels are maintained through the balance of gluconeogenesis, glycogenolysis, and glycogenesis. In order to avoid hypoglycemia (low blood sugar) and hyperglycemia (high blood sugar), which can both have major health consequences such as diabetes and metabolic syndrome, proper blood glucose management is essential.

3. Biosynthesis of Other Molecules:

Nucleotides, which are the building blocks of DNA and RNA, and some amino acids are synthesised with the help of precursors that are provided by the metabolism of carbohydrates, namely the Pentose Phosphate Pathway (PPP). These chemicals are essential for the growth, division, and repair of cells. The PPP produces NADPH, which is also necessary for biosynthetic processes and preserving the antioxidant state of cells.

4. Fuel for the Brain:

Glucose is the primary fuel source for the brain, which is highly dependent on a constant supply of glucose due to its high metabolic demand. Adequate carbohydrate metabolism is crucial for cognitive function, memory, and overall brain health. Prolonged low glucose levels can lead to neurological impairments.

5. Storage of Energy:

Excess glucose is stored as glycogen in the liver and muscles. This stored energy can be mobilized during fasting, physical activity, or stress. Glycogen storage ensures that the body has a reserve of energy that can be quickly accessed, especially during times when food intake is not available.

6. Support of Immune Function:

Carbohydrate metabolism is involved in the production of glycoproteins and glycolipids, which are essential for the function of immune cells. These molecules play a key role in cell recognition, signaling, and the immune response, which is vital for defending against pathogens.

7. Impact on Metabolic Health:

Lipid metabolism is impacted by the metabolism of carbohydrates and vice versa. Insulin resistance, obesity, and dyslipidaemia can result from imbalances in the metabolism of carbohydrates.Maintaining metabolic health and preventing chronic diseases like type 2 diabetes, cardiovascular disease, and obesity depend on proper carbohydrate metabolism.

Importance of Carbohydrate metabolism in Prosthodontics :

Carbohydrate metabolism plays a significant role in prosthodontics, particularly in relation to oral health, dental materials, and the management of prosthetic devices. Here's how carbohydrate metabolism is important in the field of prosthodontics:

A. Impact on Oral Microbiome and Dental Caries:

Oral bacteria, especially Streptococcus mutans, convert carbohydrates in the diet into acids. These acids cause the oral cavity's pH to drop, which demineralises tooth enamel and promotes the growth of dental caries, or tooth disease. When prosthodontic treatment is being planned, dental caries must be taken into account. In order to avoid dental caries developing under and around prosthetic devices such as crowns, bridges, and dentures, patients with high caries risk need to be carefully managed.[11]

B. Material Selection and Biocompatibility:

Acidic circumstances can arise from the byproducts of glucose metabolism, which have an impact on the oral environment. The durability and functionality of dental materials used in prosthodontics, such as metals, composites, and cements, can be impacted by these acidic environments. In order to ensure that prosthetic devices are durable, choosing materials resistant to acid breakdown requires an understanding of carbohydrate metabolism. To prevent degradation or failure, materials that can handle the acidic conditions must be selected.[12]

C. Management of Soft Tissue Health Around Prostheses:

Because of the accumulation of plaque and tartar caused by oral bacteria's digestion of carbohydrates, gingivitis and periodontal disease might result. The acidic byproducts have the potential to irritate gingival tissues, resulting in infection and inflammation that may impair prosthesis fit and performance. Sustaining periodontal health is essential for prosthetic treatment outcomes. In order to prevent periodontal disease, which can compromise the stability and longevity of prosthetics, prosthodontists must take into account the impact that glucose metabolism has on gingival tissues and make sure that their patients practise good oral hygiene.[13]

D. Dietary Counseling and Prosthetic Maintenance:

The oral environment is immediately impacted by carbohydrate intake, which also influences the risk of periodontal disease and caries, two conditions that can negatively affect the outcome of prosthetic treatments. Patients, especially those with fixed or detachable prostheses, require nutritional counselling from prosthodontists in order to minimise the consumption of fermentable carbohydrates and encourage a diet that maintains dental health. This aids in preserving the integrity of the surrounding tissues and the natural teeth that are still present.[14]

E. Influence on Saliva Production and Prosthesis Comfort:

Saliva production and composition can be influenced by food overall and by the metabolism of carbohydrates. Saliva is essential for lubricating tissues, counteracting oral acidity, and improving the comfort and fit of prosthetic appliances. The comfort and functionality of dentures and other prosthetics depend on adequate saliva production. Saliva reduces pain and irritation by aiding in the stability and retention of dentures. To make sure that the condition of dry mouth (xerostomia) is not made worse by the metabolism of carbohydrates, prosthodontists must evaluate and treat their patients with this disease.[15]

Step by step process of carbohydrate metabolism and its end products :

Carbohydrate metabolism involves a series of biochemical processes through which the body converts carbohydrates into energy. Here’s a step-by-step breakdown of the process, focusing on the major pathways and their end products.

1. Digestion of Carbohydrates

Carbohydrates from food are broken down into simpler sugars (mainly glucose) in the digestive tract. Salivary amylase in the mouth starts the process, followed by pancreatic amylase in the small intestine, which breaks down starches into maltose, and then enzymes like maltase, sucrase, and lactase in the intestinal lining convert disaccharides into monosaccharides (glucose, fructose, and galactose). End Products are Glucose, fructose, and galactose.[16]

2. Absorption and Transport

The monosaccharides (mainly glucose) are absorbed through the intestinal wall into the bloodstream. Glucose is then transported to cells throughout the body. End Products are Circulating glucose in the blood.[17]

3. Glycolysis

The initial stage of glucose metabolism, known as glycolysis, takes place in the cytoplasm of cells. Two pyruvate molecules—three carbon atoms each—are created from one glucose molecule (six carbon atoms). Additionally, two ATP molecules and two NADH molecules (electron carriers) are gained net from this process. Final Products: 2 NADH, 2 ATP, and 2 Pyruvate.[18]

4. Pyruvate Oxidation

Pyruvate is transported into the mitochondria, where it is converted into Acetyl-CoA. This conversion is catalyzed by the pyruvate dehydrogenase complex and produces one molecule of NADH and one molecule of CO_2 per pyruvate. **End Products**: 2 Acetyl-CoA, 2 NADH, and 2 CO_2 (per glucose molecule).[19]

5. Citric Acid Cycle (Krebs Cycle)

Acetyl-CoA enters the citric acid cycle (Krebs cycle) in the mitochondria. Through a series of reactions, it is oxidized to produce ATP, NADH, $FADH_2$ (another electron carrier), and CO_2. **End Products**: 2 ATP, 6 NADH, 2 $FADH_2$, and 4 CO_2 (per glucose molecule).[20]

6. Oxidative Phosphorylation (Electron Transport Chain)

The inner mitochondrial membrane's electron transport chain is supplied with electrons by NADH and $FADH_2$. A proton gradient is produced as electrons go along the chain, propelling ATP synthase's synthesis of ATP. The last electron acceptor that forms water is oxygen. End Products: Water (H_2O) and about 26–28 ATP molecules (per glucose molecule).[21]

7. Glycogenesis

When glucose levels are high, glucose is stored as glycogen in the liver and muscle cells through glycogenesis. This process involves the conversion of glucose-1-phosphate to glycogen. **End Products**: Glycogen.[22]

8. Glycogenolysis

When energy is needed, glycogen is broken down into glucose-6-phosphate through glycogenolysis. This glucose can then enter glycolysis or be released into the bloodstream (in the liver). **End Products**: Glucose-6-phosphate and free glucose (in the liver).[23]

9. Gluconeogenesis

When glucose is not readily available, the body can produce glucose from non-carbohydrate precursors such as lactate, glycerol, and amino acids through gluconeogenesis, primarily in the liver. **End Products**: Glucose.[24]

Deficiency of carbohydrate metabolism and its effects on prosthodontics:

Inadequate metabolism of carbohydrates can have serious consequences for general health, including dental health, which is essential in prosthodontics. These deficits can impact the efficacy and durability of prosthodontic therapies and can result from metabolic abnormalities, hormone imbalances, or nutritional problems.

1. Impact on Oral Health and Dental Caries:

Deficits in the metabolism of carbohydrates, such as those found in diabetes or other metabolic disorders, can raise blood glucose levels and change the composition of saliva. The prolonged exposure of teeth to carbohydrates and acidic metabolites from bacterial metabolism may lead to an increased risk of dental caries. Because dental caries can weaken the teeth that support prosthetic devices like crowns, bridges, and partial dentures, it is a major concern in the field of prosthodontics. A higher risk of caries may cause these restorations to fail and require replacement or repairs more frequently.[25]

2. Gingival and Periodontal Health:

A higher risk of periodontal disease might result from deficiencies in the metabolism of carbohydrates, particularly in situations like diabetes where they can worsen inflammatory responses and hinder the healing of wounds. Increased levels of inflammatory cytokines, which lead to periodontal disease and gingival inflammation, are linked to poor glycaemic management. The stability of prosthetic devices depends on periodontal health, especially when implants or partial dentures are involved. Reduced lifespan of prosthetic restorations, abutment tooth movement, and implant failure can all result from compromised periodontal health.[26]

3. Altered Salivary Composition and Xerostomia:

Changes in salivary gland function and composition can result in xerostomia, or dry mouth, which is a condition caused by metabolic diseases that impact the metabolism of carbohydrates. Because of this condition, saliva's ability to buffer acids and provide antimicrobial activity is diminished, which increases the risk of dental caries and mucosal infections. In addition to decreasing denture stability and retention and raising the risk of fungal infections like candidiasis, xerostomia can make wearing dentures uncomfortable. In order to guarantee prosthetic device comfort and functionality, xerostomia management is essential.[27]

4. Increased Risk of Infections:

A weakened immune system brought on by impaired glucose metabolism, particularly in cases of poorly managed diabetes, can leave patients more vulnerable to infections, including mouth diseases like candidiasis and periodontitis. Infections can make prosthodontic treatments more difficult, including implant implantation and denture wear. The success rate of prosthetic interventions may be lowered by infections that cause denture stomatitis or peri-implantitis, which is inflammation surrounding dental implants.[28]

5. Delayed Wound Healing:

Deficiencies in the metabolism of carbohydrates, particularly in diabetes, can hinder the healing of wounds by decreasing blood flow, producing less collagen, and making wounds more prone to infection. The integration of dental implants, the healing of surgical sites following grafts or extractions, and the general success of intricate prosthodontic operations can all be impacted by delayed healing. This may result in problems and longer recovery durations, necessitating further treatments.[29]

6. Osteoporosis and Bone Health:

Reduced bone density in systemic disorders such as osteoporosis can be attributed to inadequate metabolism of carbohydrates. This may be related to both chronic inflammation and disrupted insulin signalling, which have a deleterious effect on bone metabolism. The effectiveness of dental implants and other bone-dependent prosthetic therapies may be impacted by decreased bone density and quality. Individuals with poor bone health may struggle to get solid prosthetic restorations or risk implant failure. [30]

Precautions should be taken to improve deficient carbohydrate metabolism:

Improving deficient carbohydrate metabolism involves a combination of lifestyle changes, medical management, and dietary modifications. These precautions are particularly important for individuals with conditions such as diabetes, insulin resistance, or other metabolic disorders that impair carbohydrate metabolism.

1. Dietary Management

Balanced Diet: Consuming a diet rich in whole grains, vegetables, fruits, and lean proteins can help stabilize blood sugar levels. Low glycemic index (GI) foods are particularly beneficial as they cause a slower, more gradual rise in blood glucose.

Portion Control: Monitoring portion sizes, especially of carbohydrate-rich foods, can prevent spikes in blood sugar levels and improve insulin sensitivity.

Fiber Intake: A diet high in dietary fiber slows carbohydrate absorption and improves glucose metabolism, which is essential for managing blood sugar levels. [31]

2. Regular Physical Activity: Any type of physical activity should be undertaken by the patient.

Carbohydrate metabolism relevance in Prosthodontics :

Carbohydrate metabolism is highly relevant in prosthodontics due to its significant impact on oral health, which directly influences the success and longevity of prosthetic treatments. Here are the key aspects where carbohydrate metabolism intersects with prosthodontics:

1. Influence on Oral Microbiome and Dental Caries

Dental caries develops primarily as a result of the metabolism of carbohydrates by oral bacteria, specifically the conversion of sugars to acids. This is important in prosthodontics because dental caries can damage teeth that support prosthetics like bridges, crowns, and dentures by compromising their structural integrity. Individuals who have impaired glucose metabolism, such as those with uncontrolled diabetes, are more likely to develop dental caries, which can make prosthetic treatments less effective and require more frequent repairs or replacements.[32]

2. Periodontal Health and Prosthetic Success

A proper metabolism of carbohydrates is necessary to keep the periodontal and gingival tissues in good condition. Diabetes, which is characterised by poorly managed blood glucose levels, can worsen periodontal disease, which might jeopardise the stability and integrity of the tissues.Periodontal disease can cause teeth to become loose, bone loss to occur, and eventually prosthetic devices like bridges and implants to fail. Thus, controlling the metabolism of carbohydrates is essential to guaranteeing the long-term effectiveness of these therapies.[33]

3. Xerostomia and Prosthetic Comfort

Deficient carbohydrate metabolism can lead to xerostomia (dry mouth), which is common in patients with diabetes or other metabolic disorders. Xerostomia reduces saliva production, which is essential for the comfort and retention of dentures and other prosthetic devices. A dry oral environment can cause discomfort, increase the risk of fungal infections, and decrease the retention and stability of dentures, making them less effective and more likely to cause irritation.[34]

4. Wound Healing and Implant Success

Wound healing is impacted by the metabolism of carbohydrates, especially in diabetic patients who may have delayed healing because of poor glucose management. This is especially important for operations like implant insertion in dentistry, where healthy, healing tissues are necessary for proper osseointegration. Prosthodontic therapies are concerned about consequences like infection and implant failure, which can arise from inadequate or delayed wound healing. Thus, effective control over the metabolism of carbohydrates is crucial to the outcome of surgical procedures.[35]

5. Salivary Changes and Prosthetic Material Longevity

Saliva's composition can change due to changes in carbohydrate metabolism, either making it less effective in buffering acids produced by oral bacteria or making it more acidic. This may have an impact on the durability of metals, composites, and cements—dentistry materials utilised in prosthodontics.In an acidic climate, materials used in prosthodontic devices may deteriorate more quickly, requiring more frequent replacements or repairs. To increase the lifespan of prosthetic devices, this calls for cautious material selection and effective control of the metabolism of carbohydrates.[36]

6. Glycemic Control and Prosthodontic Outcomes

Effective management of carbohydrate metabolism is crucial in patients undergoing prosthodontic treatments, especially those with diabetes. Poor glycemic control can complicate both surgical and nonsurgical prosthodontic procedures. Patients with poor glycemic control are at a higher risk for complications such as infection, delayed healing, and implant failure. Preoperative and postoperative management of blood glucose levels is essential to ensure successful prosthodontic outcomes.[37]

Disorders relevant to Carbohydrate metabolism :

Several disorders related to carbohydrate metabolism can significantly impact overall health, including oral health, which is of particular interest in fields like prosthodontics. These disorders often involve the improper metabolism of carbohydrates, leading to a range of systemic and local effects.

1. Diabetes Mellitus

A class of metabolic diseases known as diabetes mellitus is typified by persistently high blood sugar levels brought on by deficiencies in either insulin secretion, insulin action, or both. Type 2 diabetes (insulin resistance plus relative insulin shortage) and Type 1 diabetes (autoimmune death of insulin-producing cells) are the two main forms. One of the most prevalent and thoroughly researched disorders of the metabolism of carbohydrates is diabetes. Diabetes that is not properly managed can cause consequences that are related to prosthodontics, including periodontal disease, an increased risk of infection, slowed wound healing, and tooth caries.38**2. Glycogen Storage Diseases (GSD)**

A class of hereditary metabolic illnesses known as glycogen storage diseases are defined by aberrant glycogen utilisation and storage in the body. Depending on the kind of GSD, these conditions are caused by deficits in particular enzymes involved in the metabolism of glycogen and produce a range of symptoms. Although GSDs mostly affect the muscles and liver, some forms can also cause oral symptoms such hypoplasia of the enamel, delayed tooth eruption, and an increased risk of periodontal disease. For those impacted, this may make prosthodontic treatment more difficult.[39]

3. Galactosemia

A uncommon hereditary condition called galactosemia impairs the body's capacity to digest and transform the sugar galactose—found in milk—into glucose. As a result, galactose-1-phosphate builds up in tissues, harming the kidneys, liver, brain, and eyes. Galactosemia patients may have hypoplasia of the enamel, delayed eruption of teeth, and a greater risk of infections as a result of immune system malfunction, all of which can make prosthodontic treatment more difficult. Tight nutritional control is necessary to avoid problems.[40]

4. Lactose Intolerance

The inability to digest lactose, the sugar present in milk and dairy products, is known as lactose intolerance. This is caused by a lack of the enzyme lactase, which breaks down lactose in the small intestine. Gastrointestinal symptoms like diarrhoea, bloating, and abdominal pain might be brought on by this illness. Although lactose intolerance mostly affects the gastrointestinal tract, it can also have an indirect effect on oral health by reducing dietary calcium intake, which is necessary for healthy teeth and bones. Prosthodontic therapies may be affected by this, especially in terms of keeping alveolar bone in a good state for implant implantation.[41]

5. Fructose Intolerance

Hereditary fructose intolerance (HFI) is a type of fructose intolerance caused by a genetic disorder where the body lacks the enzyme aldolase B, which causes fructose-1-phosphate to build up in the kidneys and liver. It can also relate to dietary fructose intolerance, a condition in which eating too much fructose results in symptoms related to the gastrointestinal tract. Fructose-containing foods must be avoided by people with inherited fructose sensitivity, which can make nutritional management more difficult and could have an adverse effect on dental health. Maintaining a healthy diet is essential to avoiding issues that can compromise prosthodontic care.[42]

6. Insulin Resistance and Metabolic Syndrome

A disease known as insulin resistance occurs when the body's cells are unable to utilise insulin as intended, which raises blood glucose levels. It is a crucial component of the metabolic syndrome, a group of illnesses that raises the risk of type 2 diabetes, heart disease, and stroke. Type 2 diabetes is closely associated with insulin resistance and metabolic syndrome. Diabetes is linked to a number of oral health issues, including periodontal disease, xerostomia, and delayed healing. Prosthodontic treatments may not go as planned if certain problems exist.[43]

7. Pyruvate Dehydrogenase Deficiency

Pyruvate dehydrogenase deficiency is a rare genetic disorder affecting the enzyme complex responsible for converting pyruvate to acetyl-CoA, a critical step in carbohydrate metabolism. This deficiency leads to an accumulation of lactic acid and severe metabolic acidosis. Although rare, pyruvate dehydrogenase deficiency can cause severe neurological and muscular problems that might indirectly affect oral health. The condition requires strict dietary management to limit carbohydrate intake, which may influence nutritional status and oral health.[44]

Excess carbohydrate metabolism and its significance in prosthodontics :

Excessive carbohydrate metabolism, particularly when it involves a high intake of refined sugars and simple carbohydrates, can have several significant implications for oral health, which are particularly relevant in the field of prosthodontics. Here are the key aspects:

1. Increased Risk of Dental Caries: Consuming too many carbohydrates, especially sugars, gives oral bacteria—specifically Streptococcus mutans—a lot of substrate on which to grow and create acids. Dental caries arises from the demineralisation of enamel by these acids. The structural integrity of teeth supporting prosthetic devices including crowns, bridges, and dentures might be jeopardised by caries. Secondary caries can cause restorations in individuals who already have prosthetics to fail, requiring replacements or repairs.[45]

2. Impact on Periodontal Health: Consuming a lot of sugar can increase inflammation and plaque accumulation, which can cause gingivitis and periodontitis. Maintaining the health of the tissues supporting prosthetic devices is crucial, and periodontal disease can be made worse by the inflammation brought on by an excess of glucose metabolism. Gum recession, tooth loosening, and bone loss can all be consequences of periodontal disease. This may have an impact on the longevity and stability of dental implants, dentures, and other prosthetic devices in the field of prosthodontics.[46]

3. Soft Tissue and Mucosal Health: Excessive sugar intake can also alter the composition of oral biofilms and reduce salivary flow, leading to xerostomia (dry mouth). This can create an environment conducive to fungal infections such as candidiasis. For patients with dentures, reduced salivary flow and altered mucosal health can lead to increased discomfort, poor denture retention, and a higher risk of fungal infections under the prosthesis.[47]

4. Obesity and Metabolic Syndrome: Overconsumption of carbohydrates, especially from diets heavy in sugar, is a contributing factor to metabolic syndrome and obesity. Insulin resistance, systemic inflammation, and other metabolic diseases are linked to these ailments.The efficacy of prosthodontic treatments may be jeopardised by periodontal disease, which is associated with higher risks of obesity and metabolic syndrome. These disorders may also result in difficulties healing following surgical procedures, including implant insertion.[48]

5. Increased Risk of Temporomandibular Joint (TMJ) Disord: Excessive carbohydrate intake, especially in the form of soft, sugary foods, can lead to poor occlusal habits and contribute to the development of TMJ disorders due to altered bite forces and muscle strain. TMJ disorders can complicate the fitting and function of prosthetic devices, leading to discomfort and reduced effectiveness of treatments such as dentures, splints, and occlusal guards.[49]

6. Alveolar Bone Density and Stability: Excessive sugar consumption can lead to systemic conditions like diabetes and metabolic syndrome, which are associated with decreased bone density and increased risk of bone loss. Reduced bone density can affect the stability of dental implants and the success of other prosthetic treatments that rely on healthy alveolar bone. Maintaining bone health is crucial for the longevity and success of prosthetic devices.[50]

CONCLUSION:

Many elements of oral health that are important to prosthodontics are significantly impacted by the metabolism of carbohydrates. For prosthodontic procedures to be successful and last a long time, people with illnesses like diabetes must have their carbohydrate metabolism well managed.

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