



Diabetes and Its Impact Degrading Oral Health

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Abstract

Background: Diabetes elevates the blood sugar level and creates barriers to maintaining the patient's oral health. In this context, people living with diabetes become more likely to develop different types of gum diseases, such as periodontitis, gingivitis, halitosis, oral thrush, dry mouth and even loss of teeth.

Materials and Methods: An interpretivism research philosophy has been used and secondary qualitative data has been collected. The collected data has been analysed, interpreted and illustrated using a systematic review and a thematic analysis. A total of four journals associated with the research subject have been selected from Google Scholar and assessed.

Results: The results of the data analysis procedure have disclosed relevant insights regarding common oral health issues and prevention practices. It has been identified that diabetes has a common impact on oral health and can cause various types of gum diseases.

Conclusion: In order to prevent oral health issues associated with diabetes, diabetic patients should focus on regular diagnosis of their oral health.

Keywords: Diabetes, oral health issues, gum diseases, high blood sugar.

1. Introduction

1.1 Background

Diabetes is regarded to be among the most common chronic diseases that hold a long-lasting impact on the patients' health and metabolism. In addition, this disease prevents the development of insulin which is naturally produced in the human body for controlling the blood sugar level. In this context, high blood sugar causes severe health complications along with affecting physical and mental well-being. On the other hand, people living with diabetes are more likely to develop several types of oral issues and complications. Among these, the most common oral health issues due to diabetes include halitosis or "chronic bad health", oral thrush, dry mouth, different types of gum diseases and loss of teeth. It has been observed that diabetes has a direct influence on the oral cavity of diabetic children [1]. Apart from this, diabetes comes under a group of chronic diseases among which, diabetes mellitus maintains a major impact on the oral health of patients.

Diabetes mellitus enhances the risk of dental caries which is a multifactorial oral disease. Children and adolescents living with diabetes are the most vulnerable group to be affected by oral health issues. Along with that, oral healthcare providers can play an active role in detecting diabetes mellitus and prediabetic among patients [2]. The main factor correlating diabetes and oral health issues is a lack of insulin and high blood sugar, which creates

barriers to maintaining effective oral health among patients. Consequently, periodontitis has been identified to be the main oral healthcare issue affected by diabetes mellitus and this is due to “poorer glycaemic control”. Maintaining oral health is vital; however, negligence, late diagnosis and diabetes can affect this area which eventually causes severe oral health issues including gum diseases and loss of teeth. In this regard, timely diagnosis of diabetes and regular consultation with an oral healthcare professional is required.

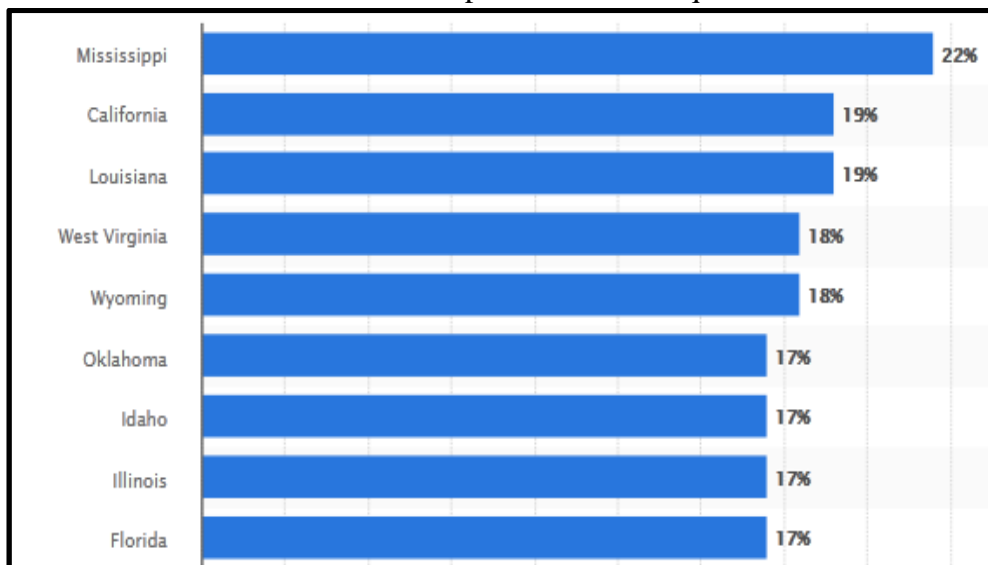


Figure 1.1: Share of different states with major oral healthcare issues among children and adolescents
(Source: 3)

It has been observed that periodontitis, dental caries or cavities and gingivitis are the major oral healthcare issues. Apart from this, in the US, approximately 15% of children and adolescents suffer from oral health complications [3]. These statistics indicate the high prevalence of oral healthcare and the context of the degradation of oral healthcare services. In addition, private health insurance providers have disclosed that oral healthcare expenses are the leading among healthcare spending. These aspects show that the prevalence of diabetes mellitus and increased dental healthcare spending has created major barriers for people to access and gain required oral healthcare services. Regarding this, around 20% of people aged over 45 and 4% of people aged fewer than 18 face barriers in accessing required oral treatment [4]. Therefore, focusing on regular oral health checkups and early diagnosis is highly required as well as government initiatives for decreasing the cost of oral healthcare services.

1.2 Aim and objectives

The following study aims to address the impact of diabetes on the degrading oral health of patients and potential strategies to prevent these issues.

Objectives

- To address the common oral health issues due to diabetes
- To evaluate the impact and implication of these issues and potential prevention practices
- To develop suitable strategies to promote oral health among diabetic patients

1.3 Significance of the research

The present study has been carried out to highlight and disclose the effects and implications of diabetes in degrading healthcare and enhancing healthcare issues. In this regard, the common oral health issues, prevention practices and potential strategies to promote oral healthcare among patients suffering from diabetes. It has been identified that people suffering from diabetes have a major chance of getting infected with severe oral healthcare issues and gum diseases. These issues can ultimately lead to the loss of teeth or the development of serious gum diseases. Focusing on diagnosing oral healthcare of diabetic patients and decreasing the cost of oral healthcare treatment can help to promote effective oral healthcare among patients living with diabetes.

2. Materials and Methods

2.1 Research philosophy

Research philosophy deals with the factors that are associated with the development of how the information and data about the phenomenon of the study will be gathered and analysed. Philosophical perspectives are important because it reveals the assumptions of the researcher about their research and choices are applied to the purpose of the study which is defined as methods of the research and also data analysis and data interpretation. Apart from that, philosophical thinking helps the researcher to think strongly and helps them to emphasis a clear concept about the problems of the research study and helps them to select relevant data and for assessing effective ideas and proposals. The *interpretivism philosophy* is based on the naturalistic approach of data collection as it provides different strategies for the researcher to have a clear observation of the gathered information about the phenomenon of the study to conduct the research paper in a specific and natural way [5]. The interpretivism philosophy has been followed in this study for collecting the data in a specific way about the phenomenon of the study and to conduct the research paper in a very naturalistic way.

2.2 Research approach

The research approach plans the procedures of the research in which different appropriate steps are included such as broad assumptions to the detailed manner of data collection and data interpretation which improves the outcomes of the research study and helps the research to conduct an effective research study. A research approach gives provides scientific findings and also provides strategies for the researcher to keep them on track, making the research process smooth, effective and manageable. The research approach is divided into two groups such as inductive and deductive among them the inductive research approach has been followed throughout this study. The *inductive approach* helps the researcher in concluding by going through the specific to general analysis of the collected data for the phenomenon of this study [6]. Thus, the inductive approach is best suited for this study as it provides ways for the researcher to go through the collected information about the phenomenon of the study to conduct the research paper in a proper way by interpreting the collected data from specific to general.

2.3 Research design

Research design is concerned with establishing answers to the questions about the phenomenon of the study and providing ways in which these questions will be answered by the researcher. Research design is an essential part of methodology as it answers the basic

research questions and enables a deeper understanding about the phenomenon of this study. The *exploratory design* helps the researcher to explore the different aspects of the phenomenon of the study to answer the questions that have not been studied in a detailed manner previously [7]. The main purpose of exploratory design is to help the researcher to define the gathered data and interpret it in a depth manner to conduct an appropriate and effective research study. Thus, the exploratory research design is best suited for this study and it has been followed throughout the study to answer all the questions by interpreting the data in a detailed manner which helps the researcher in conducting an appropriate research study.

2.4 Data collection

Data collection is an essential procedure of methodology in research that involves exploring the research phenomenon and gathering reliable and relevant information for building knowledge. The main types of data collection methods are primary or secondary and the primary method involves collecting raw and fresh data by exploring the research population, while the secondary method involves exploring published studies. In the present study, the researcher has decided to use a secondary data collection method for gathering qualitative data associated with the research phenomenon. Secondary data mainly refers to the data that has been collected previously for different purposes and can be reused [8]. In this regard, relevant and reliable journals, newspaper articles and websites have been explored for data collection. Using this data collection approach will help to explore large datasets and gain potential knowledge regarding the implications and the impact of diabetes in causing severe health complications.

2.5 Inclusion and exclusion criteria

Inclusion criteria

- Previously published journals, websites and articles that are relevant and reliable have been used for data collection.
- Journals and websites published in 2018 or after the year have been used for data collection purposes.
- Secondary sources that are free to access and have been published in the English language have been included in the data collection procedure.

Exclusion criteria

- Secondary data sources that are not free for accessing and have been published before 2018 have been excluded.
- Journals, articles and websites lacking relevant and reliable data have not been used for data collection.
- Secondary sources containing information in other languages than English have been excluded.

2.6 Data analysis

The main focus of a scientific investigation is to develop relevant knowledge and insights associated with the research problem. In this regard, the data analysis procedure is carried out to assess, interpret and illustrate the collected data. The researcher has chosen a secondary qualitative data collection method and in order to analyse the qualitative data, a systematic review and a thematic analysis will be conducted. It has been observed that thematic analysis

is regarded to be among the most common approaches to analysing and illustrating qualitative data and it helps to address patterns out of the gathered data [9]. Along with that, a systematic review has been conducted by using a total of 4 journals and the themes have been developed depending on the research objectives and the findings of the systematic review.

2.7 Ethical consideration

Maintaining research ethics helps to maintain scientific integration in an investigation along with protecting human interests and rights associated with the investigation. Additionally, protecting human rights and interests through maintaining potential research ethics is vital for research [10]. In the following study, secondary qualitative data has been collected by exploring relevant journals, articles and websites and all potential research ethics have been maintained during the data collection and analysis procedures. Only the websites and journals that are free to access have been used, no natural elements have been harmed and no data has been manipulated during the data collection and analysing processes.

3. Results and Discussion

3.1 Systematic table

Table 1: Systematic table

<i>Source</i>	<i>Methodology</i>	<i>Key findings</i>	<i>Significance</i>
Padhi, Nayak, Behera, 2020. [11]	Secondary data has been collected in this review article to explore the pathophysiology of type 2 diabetes and to elaborate on the different approaches to treating patients with type 2 diabetes.	A higher incidence of obesity has increased the number of diabetic patients which promotes many companies to invest their money in the making of anti-diabetic medication. A nanoformulation drug delivery system is implemented in the making of anti-diabetic medication.	Nanotechnology provides guarantees to bring advancement in the making process of anti-diabetic medicines by breaking different therapeutic grounds. Nanoformulation with FDA provides more safety and enhances the efficiency of anti-diabetic medication.
Borgnakke, 2019. [12]	In this review article, secondary qualitative data has been selected to evaluate the understanding of the two-way relationship between diabetes and oral health issues.	Diabetes and oral health issues have a two-way relationship and excessive diabetes increases the risk factors for oral health issues. Poor diet habits lead to poor nutrition which impacts the quality of life as well as diminished oral health conditions. Missing teeth also increases different oral health issues due to the inability of defending the bacteria.	In a vicious cycle dysglycemia and oral health affect each other and impacts negatively upon oral health. An unhealthy lifestyle leading to diabetic patients increases the issues of oral health of diabetic patients. This study has evaluated the significant role of diabetics in developing different oral health issues and the negative impact of oral bacteria on diabetic patients.
Gabriel, et al. 2020. [13]	The primary data collection method has been followed in this study to conduct the clinical trial on participants of 45 to 74 years old aged males and females.	In the randomization of the study sample, a total number of 809 people have surveyed among them 4.2% people are at baseline prevalence of diabetes, and 5.3% have severe neuropathy. This clinical trial focuses on evaluating the different effects of diabetes on	Micro vascular complications are seen in the early stage of hyperglycemia or diabetes and prevention of micro vascular complications helps to reduce the negative effects of hyperglycemia among elderly people. In this trial, cardio-metaphoric risk factors are

		health conditions. It also shows the impact of prevention of micro vascular complications improves the health condition.	compared to have an in-depth understanding of the disease. Hence, this trial has significantly included factors associated with micro vascular complications in the early stage of diabetes to reduce its negative impacts of it.
Watanabe, et al. 2020. [14]	In this review article, a secondary data collection method has been followed to conduct the article in an appropriate way by evaluating the oral functions of the human body such as the number of teeth, dentures, occlusion and others.	Different dental policies have been evaluated in this study and have an insightful overview of the oral functions of the human body. There is a clear discussion about health and longevity by improving dental care and dental treatment.	Improved dental care and dental treatment positively impact the oral health issues of human beings. This study has shown a clear relationship between health and longevity indices which can be improved by dental treatment and improving oral functions. Hence, this study has provided significant information about the factors associated with dental care and dental treatment to improve the oral health issues of human beings.

(Source: Self-developed)

3.2 Thematic analysis

3.2.1 Types of diabetes and Common issues of diabetes on oral health

Diabetes is a chronic disease that affects the human body by creating disruption in the process of turning food into energy in the human body. Most of the food consumed by an individual person the metabolism system of the human body breaks down the food into sugar or glucose and releases it into the bloodstream of the human body. In the human body, when the blood sugar levels go up it gives signals to the pancreas to release insulin in the body. Insulin acts like a key to let blood sugar into the human body cells for use as energy. People who have diabetes do not make enough insulin and the body stops reacting to insulin. Due to this, too much sugar or glucose stays in the bloodstream and over time it develops many serious health issues in the body such as **“heart disease”, “vision loss”, “kidney disease”** and some others [11]. There are 3 main types of diabetes **“type 1”, “type 2”** and **“gestational diabetes”** which badly impact the health conditions of the whole world.

In **type 1** diabetes the pancreas of the human body does not make any insulin and in **Type 2** the pancreas does not make enough insulin and the insulin made by the pancreas does not work as it should. **Type 2** diabetes is seen among the elderly population of the world which negatively affects the oral health of the common people. **“Diminished salivary flow”** is a common oral health issue among the diabetic patients which causes a burning sensation in the mouth or tongue and enlarges the parotid salivary glands. Besides that, **dry mouth, gum inflammation, periodontitis** and many other oral health issues are developed over time in the human body due to diabetes [15]. Diabetes weakens the white blood cells which thicken the blood vessels and slow nutrient flow in the body and slows the procedures of waste management of products from body tissues including the mouth. Thus, diabetes causes

different oral health issues as it weakens the working process of the blood cells of the human body which fails to defend the bacteria in the mouth which led to different gum infections.

3.2.2 Prevention of diabetes' impact on oral health

Diabetes can cause any complication in the human body as it disrupts the blood circulation of the human body which negatively impacts health and creates several health issues, especially among elderly people. People who have diabetes know that it can harm their “eyes”, “nerves”, “kidneys” and any other important system in the body. People with diabetes suffer from periodontal disease, an infection in the gum and bone where it holds the teeth in place. This disease leads to pain, bad breath that does not go away, chewing difficulty and even tooth loss. Besides that, diabetes is frequently accompanied by dry mouth due to the side effects of the medication which leads to bad breath, difficulty swallowing, speech difficulties and many others [12]. However, there are many other oral health issues that are caused due to diabetes such as tooth decay where the level of acidity rises, which breaks down the hard enamel shells of the tooth and leads to cavities and tooth loss.

Gingivitis leads to bleeding gums, periodontitis is a serious tooth infection which leads to heavy bleeding from gums, thrush, slow wound healing and many others. It is very important for every diabetic patient to have a healthy and maintained lifestyle to maintain the sugar levels in the body. A report from 2021 shows that almost around 10.5% of the global population was suffering from diabetes and it will increase up to 12% by 2045 [16]. Besides that, regular physical exercise and activity, maintaining normal body weight, following a proper diet chart and avoiding tobacco are the main ways to prevent diabetes which positively impacts the oral health of people. Apart from that, oral health issues can be resolved by maintaining the mouth to prevent different bacteria such as brushing twice a day, regular dental checkups and many others [13]. Thus, prevention strategies for diabetes positively reduce the risks of oral health issues and positively impacts healing from different oral health issues.

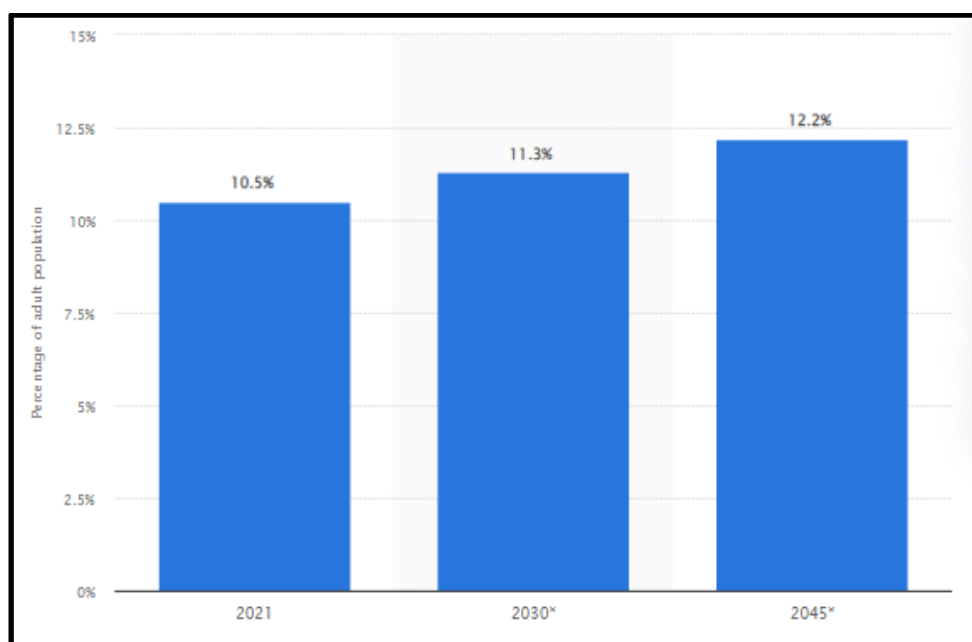


Figure 3.2.2: Diabetic patients in the global adult population (2021, 2030 and 2045)
(Source: 16)

2.3 Strategies to promote oral health among people with diabetes

“Diabetes mellitus” is a common metabolic health disease which results in a defect of insulin secretion, disruption in insulin production and taking action in the body or a combination of both. The number of people with diabetes has increased over time which is a major reason behind the number of patients with oral health issues caused by diabetes. Dentists and other oral health care providers play significant role in preventing different oral health issues and treating “periodontal disease” and other oral health problems among diabetic patients. It is very important for every diabetic patient to maintain their life-leading process and improve their self-care behaviours to prevent these diseases [14]. Different strategies have been implemented by dentists around the world to improve the oral health issues of diabetic patients such as **regular brushing and flossing, reducing smoking habits, regular exercise to improve the metabolism system of the body, eating foods that are low in sugars** and many others.

Besides that, the dentists also provide palms to improve their self-care process and suggest many helpful ways to improve their life-leading processes such as brushing teeth twice a day, flossing daily which helps to remove dental plaque, visiting dentists regularly even without ant dentures visiting the doctor in any change in the oral health and many others. The medication causes many oral health issues and to maintain these issues it is important to have a healthy diet every day which improves the health conditions of the patients. Different strategies have been implemented for promoting awareness about oral health issues such as **“building healthy public policy”, “establishment of supportive environment”, “strengthening the community”, “promoting healthy food habits”, “training int oral hygiene methods”** and many others [17]. However, the cost of dental care procedures is high and the government of every country across the whole world should provide different strategies to reduce the costs of dental care and provide different facilities for diabetic patients to improve their health condition.

3.3 Discussion

Diabetic patients very often suffer from many oral health issues such as gingivitis, periodontitis, halitosis, loss of teeth, dry mouth, oral thrush and many others which impact their other health conditions. High glucose in the blood also causes increased levels of sugar in the saliva and the bacterial plaque, the sticky film that builds up on teeth, feeds on these sugars which causes “tooth decay”, “cavities”, “tooth loss” and also raises the risk of periodontitis or gum disease. There are three types of diabetes among them type 2 diabetes causes different oral health issues and reduces the immunity power of the human body [18]. Diabetes reduces the white cell blood which lowers the immunity power of the human body and it fails to defend the bacterias thus different bacterial infections affect the oral health of the patients.

It is very important for every diabetic patient to lead a maintained lifestyle to improve their health conditions in regards to having a long life and especially the elderly population of the globe needs to be more health conscious. The global rate of diabetic patients is getting higher over time and thus leading a healthy lifestyle will not only improve their health condition but also reduce the risk factors associated with diabetes [19]. Diabetic patients need to follow a proper diet with proper nutrition, and exercise every day to improve their health conditions

and reduce oral health issues they need to quit smoking, brush twice a day, have regular dental checkups and many other factors to prevent diabetes and also reduce the oral health issues.

Apart from that, different strategies have been developed to promote awareness regarding oral health issues caused by diabetes among elderly people such as building healthy habits, providing knowledge among the students in the school, providing knowledge to the community people, strengthening the community, promoting eating healthy, training of hygiene method and many others [20]. It is very important to implement different strategies to improve the health care procedures for diabetic patients regarding and also implement different strategies to improve the oral health issues of the human being. Hence, these prevention strategies will spread awareness among the common people about the oral health issues caused by diabetes and it also the implication of these strategies will improve the health condition.

4. Conclusion

In the present study, the research has aimed to address oral health complications and degradation due to diabetes. An interpretivism research philosophy has been used for exploring the research phenomenon and providing relevant insights into the research problem. In order to collect reliable and relevant data on the topic of interest, an inductive research approach has been used along with an exploratory research design. These methods have helped to select suitable methods and guide the methods and techniques to gather information regarding the oral health impact of diabetes. It has been observed that diabetes creates several types of health complications and has a major impact on developing serious oral healthcare problems. Diabetes creates a barrier to developing insulin which is naturally produced in the human body through the procedures of turning food into energy. It has been observed that there are several types of diabetes including type 1, type 2 and gestational diabetes and type 2 diabetes mellitus has the most vital impact on oral health.

The main factors of diabetes affecting oral health are high blood sugar and diminished salivary flow. These factors affect the oral health of a diabetic patient and cause several types of dental health issues, including periodontitis, dry mouth, loss of teeth and various other gum diseases. It has been identified that though a major portion of people suffers from various oral health issues, diabetic people are more likely to get affected by oral health care complications. Diabetes weakens the metabolism and white blood vessels as well as elevates the blood pressure level that eventually creates various types of oral health issues including dental caries. People living with diabetes are vulnerable to fighting against bacterial infection and high blood pressure also prevents them from maintaining regular oral healthcare practices. Thus, diabetes influences the development of severe dental issues among the patient and type 1 diabetes cannot be prevented, hence, diabetic people have to focus on managing their lifestyle and regular dietary habits to control the consequences of diabetes.

Tooth decay, bad breath and gingivitis are other major oral health complications caused by diabetes. The major dental healthcare issue caused by diabetes has been identified to be periodontitis, which causes slow healing of wounds along with heavy gum bleeding. Considering these aspects, it can be stated patients living with diabetes have to focus on controlling their blood sugar level through healthy dietary habits as the prevalence of diabetes

is rapidly increasing. Obesity or excessive body weight has been identified to have a correlation with diabetes and in this regard, controlling body weight and indulging in regular physical activities can help to control diabetes. Avoiding tobacco usage can also help to delay the effects of diabetes among patients. Adopting these practices has major positive implications for reducing the prevalence of oral diseases due to diabetes mellitus. Preventing and controlling diabetes has the potential to reduce oral healthcare problems of patients living with this chronic disease as well as reducing other health complications.

It has been observed that oral healthcare services providers and dentists are vital for ensuring effective oral healthcare and treatment of patients. Diabetic people have to focus on improving their regular lifestyle habits and maintaining potential self-care practices for delaying the crucial impacts and implications of diabetes mellitus. Therefore, diabetic people can adopt various effective practices for improving their oral health, including regular flossing, brushing regularly and regular consultation with dentists. Adopting these practices and maintaining effective and healthy practices will help to decrease the prevalence of dental issues and complications in diabetic patients. It has been observed that the prevalence of oral health issues has enhanced rapidly as well as diabetes and regarding this, patients have to focus on maintaining effective healthcare practices and oral health to avoid the consequences. Thus, it can be stated that diabetes poses a major impact on degrading and affecting oral health of the patients and can cause severe complications and gum diseases.

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