Spring 4-12-2020

An Assessment of Oral Health Discussion between Primary Care Providers and Their Patients with Diabetes

Rocio Huizar
University of New Mexico

Rocio Huizar

Candidate

Dental Medicine

Department

This thesis is approved, and it is acceptable in quality and form for publication:

Approved by the Thesis Committee:

Diana Aboytes, RDH, MS, Chairperson

Christine Nathe, RDH, MS

Lindsey Lee, RDH, MS

An Assessment of Oral Health Discussion between Primary Care Providers and Their Patients with Diabetes

By

Rocio Huizar

B.S. Dental Hygiene, University of New Mexico, 2017

THESIS

Submitted in Partial Fulfillment of the

Requirements for the Degree of

Master of Science
Dental Hygiene

The University of New Mexico
Albuquerque, New Mexico

May 2020

An Assessment of Oral Health Discussion between Primary Care Providers and Their Patients with Diabetes

Rocio Huizar

B.S. Dental Hygiene, University of New Mexico, 2017

M.S. Dental Hygiene, University of New Mexico, 2020

Abstract

Individuals diagnosed with diabetes mellitus, are not given information regarding the relationship between diabetes and oral health. The purpose of this study was to assess whether primary care providers discuss the association between oral health and diabetes mellitus to their patients with diabetes, if they refer to dental providers and where is oral health ranked in importance during a routine exam.

A secure electronic survey was sent to the Medical Director of the Department of Family and Community Medicine, requesting it be forwarded to providers in each primary care clinical facility. Survey was open for two weeks, ten surveys were collected, two were incomplete, not used for data, resulting in a total of eight participants. Results were inconclusive due to limited number of participants. Overall, data suggested primary care providers do not regularly discuss the association between oral hygiene and diabetes, indicating lack of knowledge and confidence in this subject.

TABLE OF CONTENTS

List of Tables

Chapter I

INTRODUCTION

Introduction

Diabetes mellitus is one of the most common diseases among all age groups and is the seventh leading cause of death in the United States.[1,2] Diabetes is defined as a chronic disease where the body's blood has too much glucose due to inability of producing or using insulin to remove glucose from the blood.[1] Unfortunately, most individuals diagnosed with diabetes, are not aware that oral health has a direct relationship with diabetes.[3] It is important for primary care providers to discuss the importance of oral hygiene to their patients with diabetes.

Statement of the Problem

The purpose of this study is to assess whether primary care providers discuss the association between oral health and diabetes mellitus to their patients with diabetes, if they refer patients to dental providers, and where is oral health ranked in primary care providers' routine exam.

Significance of the Problem

There is a strong correlation between periodontal disease and diabetes.[4,5,6] This strong correlation supports the need for dental and medical providers to address how these two diseases can negatively impact the other.[4] An inter-professional approach is needed due to the bidirectional relationship of the two diseases.[4] Dental hygienists are trained to educate their patients regularly on the prevention and maintenance of periodontal disease, however many patients with periodontal disease are not solely coming to dental offices, but medical offices instead.[7] Additionally, patients with diabetes are recommended to routinely see their primary care providers as part of their diabetes management plan. Patients with diabetes have a high

prevalence of having periodontal disease, increasing the importance for primary care providers to discuss oral health strategies and oral disease prevention with their patients with diabetes.

Operational Definitions

Pre-diabetes- when glycemic levels are higher than normal, but are not high enough to be diagnosed as having diabetes. When diagnosed with prediabetes, over time it is possible to have Type 2 diabetes. Pre-diabetes is asymtomapic.[8]

Type 1 diabetes- Pancreas makes little to no insulin and the body. Pancreas cells are destroyed, thus producing insufficient amounts of insulin.[9]

Type 2 diabetes- occurs when the body is insulin resistant and/or pancreas does not make enough insulin. Resulting in insulin not being used properly by the body.[10]

Gestational diabetes- high glucose levels that develop during gestational pregnancy stage. Is asymptomatic and goes away after giving birth.[11]

Gingivitis- Inflammation of the gingival tissue not involving alveolar bone loss.[12]

Periodontitis- involving both inflammation of the gingival tissue and results in irreversible alveolar bone loss.[13]

Chapter II

LITERATURE REVIEW

Introduction

A bidirectional relationship between diabetes and oral health exists. This literature review will individually discuss diabetes and periodontal disease, including prevalence, types, and stages. Additionally, the correlation between periodontal disease and diabetes will be discussed along with the role primary care providers can play in the management of these two interrelated diseases.

Diabetes Mellitus

Prevalence

Diabetes mellitus is a chronic disease that affects all populations, and is the seventh leading cause of death in the United States.[1,2] In the United states, about 30.3 million individuals are affected by diabetes and about 7.2 million individuals are not aware of having diabetes.[1] Unfortunately, if these numbers do not change, by the year 2025 it is estimated that 1 in 5 individuals will be diagnosed with diabetes.[2]

Types of Diabetes

Diabetes occurs from the body's inability to produce or use insulin. Insulin is necessary to remove glucose from the blood. There are four different types of diabetes mellitus: pre-diabetes, Type 1, Type 2, and gestational diabetes. The most common type of diabetes is Type 1 (insulin dependent) and Type 2 (non-insulin dependent) diabetes.[1]

Pre-diabetes occurs when blood sugar levels are higher than the baseline, but not yet high enough to be diagnosed. According to CDC, prediabetes affects more than 84 million individuals nationwide.[2] Since prediabetes can be asymptomatic, blood tests must be performed. People with prediabetes, are more likely to develop Type 2 diabetes later in life.[14]

Type 1 diabetes accounts for 5% of people with diabetes.[15] Type 1 diabetes was referred to as insulin dependent diabetes mellitus. The definite etiology is unknown, however Type 1 diabetes mellitus results when the immune system produces many antibodies and inflammatory cells that attack the beta cells of the pancreas. The beta cells are responsible for producing insulin and this autoimmune attack results in an absolute insulin deficiency. Glucose remains in the blood and is unutilized by the body.[1]

Type 2 diabetes is the most prevalent type of diabetes and accounts for 90-95% of individuals with diabetes.[16] Type 2 diabetes was previously known as non-insulin dependent diabetes mellitus, or adult-onset diabetes mellitus. With Type 2 diabetes, beta cell destruction does not occur as in Type 1, instead the pancreas either does not produce enough insulin or is not able to use insulin well.[1] The lack of insulin production or the inability to utilize insulin creates the same result as Type 1 diabetes, an over accumulation of glucose in the blood.

Gestational diabetes is less prevalent accounting for only 2%-10% of persons with diabetes.[1] Gestational diabetes occurs during pregnancy due to hormonal changes in the women's body during pregnancy causing blood sugar to rise.[1] The fluctuation of hormones impairs the action of insulin in the mother's cells, increasing the mother's blood glucose levels.[1] This type of diabetes is usually asymptomatic and typically goes away after the birth of the baby.[11] Women who have had gestational diabetes are then at a higher risk of having high blood pressure, preeclampsia or Type 2 diabetes in the future.[11] If not controlled, women can experience a difficult birth or premature birth, and the baby can present with health problems including birth weight of more than 9 pounds, respiratory distress syndrome, hypoglycemia and an increase risk of developing Type 2 diabetes when they are older.[11]

Periodontal Disease

Periodontal disease is an inflammatory disease that can affect both the hard and soft tissues that support the teeth. There are two main types of periodontal disease: gingivitis and periodontitis. These oral diseases break down the foundation that supports the dentition by inflammation of the gingiva or periodontium respectively.[17]

Gingivitis is the first stage in periodontal disease.[17] Typically signs include redness, swelling and bleeding of the gingiva.[18] The inflammation is confined to the free gingival tissue, that includes the margin and interdental papilla. During this stage, loss of clinical attachment and alveolar bone loss does not occur.[19] Gingivitis is a reversible condition, and with an improvement in oral hygiene and/or intervention by a dental professional the health of the gingival tissue may be restored.[18]

The second stage of periodontal disease is periodontitis. Periodontitis presents as the inflammation of the periodontium that extends from the gingiva into the connective tissue and alveolar bone.[19] Unlike gingivitis, periodontitis is irreversible. Periodontal disease can be managed, but if left untreated, destruction of periodontal tissues and alveolar bones can occur, eventually leading to tooth loss.[18] Periodontitis can present itself in a variety of ways. For example, aggressive, chronic, a manifestation of systemic diseases and necrotizing periodontal disease. Aggressive periodontitis, appears when accelerated destruction of attachment and bone loss occurs. Chronic periodontitis, is more common, and slowly progresses as inflammation of the periodontal tissue, causing deep periodontal pockets and recession of gingival tissue to occur. Periodontal disease is correlated with systemic diseases, such as heart disease, respiratory disease and diabetes. In addition, necrotizing periodontal disease is identified as necrosis of the gingival

tissue periodontal ligaments and dental alveoli. Necrotizing periodontal disease is mostly seen on individuals who are immunocompromised.[18]

Correlation between Diabetes and Periodontal Disease

Patients with diabetes are three times more likely to present with periodontitis than those without diabetes.[4] Diabetes and periodontal disease have been shown to have an impact with glycemic control. One research study found a relationship among periodontal health and diabetes indicators, such as A1C levels and the extent of diabetes.[6] The U.S Third National Health and Nutrition Examination Survey (NHANES) concluded that individuals who have a A1C higher than 9% have a higher chance of having severe periodontal disease.[6] The US National Health and Nutrition Examination Survey III, found that adults with a HbA_{1c} level of >9% are at a higher risk of severe periodontitis. They also found that those with a BMI of >30 kg/m^2 are at a higher risk of periodontal disease than those with a BMI of 18-24 kg/m^2. Primary care providers should take their patients HbA_{1c} and BMI levels into consideration to prevent any severe periodontitis.[5]

One study evaluated dental caries and periodontitis in 40 subjects with controlled and uncontrolled Type 1 and Type 2 diabetes mellitus. In regards to prevalence of periodontal disease, those with controlled Type 1 diabetes, 10% presented with periodontitis. Those with uncontrolled Type 1 diabetes, 70% presented with periodontitis (Table 1). For controlled Type 2 diabetes, 50% presented with periodontitis. Finally, those with uncontrolled Type 2 diabetes it was found that 100% of the participants presented with periodontitis (Table 2). Overall, individuals with Type 2 diabetes had more oral manifestations than those with Type 1 diabetes.[20]

Type of Evaluation	Controlled Type 1Diabetes	Uncontrolled Type 1Diabetes
Periodontitis	10%	70%

Table 1: Type 1 Diabetes

Type of Evaluation	Controlled Type 2 Diabetes	Uncontrolled Type 2 Diabetes
Periodontitis	50%	100%

Table 2: Type 2 Diabetes

Periodontal Therapy and Change in Glucose Levels

Individuals with both uncontrolled Type 1 and Type 2 diabetes are more susceptible to gingival inflammation and advanced periodontal disease, when compared to those without diabetes. The effects of oral and systemic health goes both ways. As those with periodontal disease are more likely to have uncontrolled blood glucose levels. Conversely, those who receive periodontal treatment to halt the active disease, have better glycemic control and a decrease in the amount of insulin demand to the body.[6] This oral-systemic correlation is vital for both dental and medical providers to address to all patients with diabetes. In educating patients about the correlation between oral health and diabetes mellitus, oral manifestations can be prevented or reversible.

A controlled clinical trial compared the outcomes of periodontal therapy on individuals with Type 1 and Type 2 diabetes. The trial divided 70 subjects into three groups, a control group subjects with Type 1 diabetes and subjects with Type 2 diabetes. Factors that were being measured were glycated hemoglobin (HbA1c) and prostaglandin E2 (PGE2) levels.[21] Glycated hemoglobin test (HbA1c), measures glycemic level of the past 2-3 months. Hemoglobin is present in red blood cells, glucose in the blood binds to the red blood cells. When the test is done, it gives results on how much glucose is present. High HbA1c results are 6.5% or higher,

prediabetes is 5.7 to 6.4% and normal HbA1c is 5.6% or less.[22] Prostaglandins are lipids that have been shown to regulate insulin secrestion.[23] In the study, all subjects were examined three times; in the initial process of the study, then again at 3 months and 6 months. The results showed an improvement in both HbA1c and PGE2 levels for both Type 1 and Type 2 diabetes groups. More specifically the group with Type 1 diabetes, had a greater decrease in HbA1c and PGE2 at the 6-month examination.[21] Periodontal therapy can result in positive glucose changes in patients with diabetes.

In addition, there was another study that measured HbA1c levels on individuals with Type 2 diabetes. The subjects were separated into two groups. One group only had nonsurgical periodontal therapy and the other group in addition to periodontal therapy they were also given an antibiotic (Rapiclav). Results were taken from one month and 3 months after periodontal therapy. Overall, result found that there was a significant change in glycemic control in patients with Type 2 diabetes and periodontal therapy.[24] Once again studies have shown that periodontal therapy can strongly affect individual's glycemic control compared to those who do not receive periodontal treatment.

Overall, primary care providers can recommend their patients that are managing diabetes mellitus to get a prophylaxis and oral exams twice a year, or more depending on the individual's oral health condition.[25] They can also do oral examinations, discuss oral side effects that prescribed medication may cause.[26]

Primary Care Providers Education on Oral Health

If primary care providers routinely evaluated the oral health status of their patients with diabetes, their patients would be able to more effectively manage both their diabetes and periodontal disease. It is important for primary care providers to discuss oral risks with their

patients and facilitate the understanding of the interconnectedness of the two diseases.[7] Primary care providers can promote oral health by having the proper knowledge of how oral health and disease correlates with systemic diseases.[26]

Obtaining more training on oral health provides a benefit to primary care providers as well since primary care providers only receive limited oral health training.[7,27,28] One study showed that by incorporating oral health related training for primary care providers improved their delivery of comprehensive care.[7] If primary care providers are taught more about oral health, they could be an essential part in oral health of the public and promote overall health.

A study including 200 individuals with diabetes assessed whether their primary care providers referred them to a dental provider. The study consisted of a pre and post-test and one of the questions were "Have you ever been told by your diabetes doctor to see your dentist for a check-up?" Results showed that 56% said "no" and 8% "did not know" and 36% said "yes".[29]

Another study including 164 primary care providers from Jordan, were asked to fill out a survey to access their knowledge, perception and awareness of diabetes and oral health. Results revealed that only 70% of the providers have heard of the link between diabetes and oral health. The majority, agreed that diabetes increase oral health problems. Unfortunately, only half of those practitioners recommended their patients seek a dentist for any oral manifestations. In addition, 1/3 of all providers approved that oral health is linked with diabetes. Overall, practitioners have limited knowledge of the relationship between diabetes and oral health, there is a need for primary care providers to be educated in oral health and diabetes.[27]

In addition, a survey study measured primary care provider's knowledge, attitude, and practice on oral health. A sample of 227 primary care providers were surveyed. Result showed that 79% were conscious of the possibility of periodontitis and systemic diseases being linked,

but only 58% of them referred their patients to a dentist. Overall, this shows that they seem to have some knowledge of oral health, but they do not know how to educated or refer their patients.[28]

Conclusion

Primary care providers have expansive knowledge on how the body functions. There is a responsibility for all health care providers to educate patients on how to improve their overall health. Because of the strong correlation between periodontal disease and diabetes, it may be beneficial for these patients to have access to additional information and education on how to maintain both diseases. Collaboration between dental and medical professionals is often needed to better manage an individual's overall health.[4] This inter-professional approach could provide a better understanding of how one affects the other and improve patient's understanding of the significance that oral health contributes to total body health.

Chapter III

Methods and Materials

Introduction

Research has shown that patients visit their primary care provider for dental related problems.[7] Some research has shown that primary care providers have limited knowledge regarding the importance of oral health in patients with diabetes and rarely refer them to a dental provider.[7,27,28] This descriptive study will assess whether primary care providers within the University of New Mexico discuss the association between oral health and diabetes mellitus with their patients, if they refer patients to a dental provider and where oral health is ranked during a routine examination. Upon approval from the university's Institutional Review Board, data will be collected by using a short survey, via REDCap, which will be sent to the Medical Director of the Department of Family and Community Medicine, who will be forwarding the email containing a letter of support, the approved informed consent and link to the survey to other Medical Directors of UNM Primary Care Clinics. These directors will forward to providers in each primary care clinical facility. All primary care providers who participate, will be anonymous. Participants name and location of employment will not be asked.

Sample Description

This study will consist of a convenience sample of primary care providers from 10 primary care clinics who practice within the UNM Health Science Center. This includes nurse practitioners, physician assistants and medical doctors, and others. This may reach approximately 130 primary care providers. Participation is not required and all participants will be anonymous. They will be asked to complete the survey by answering all questions. These questions will be

constructed by using text response, multiple choice and a Likert scale. Participants can withdraw from the study at any time.

Research Design

This study will use a descriptive approach. Primary care providers will have two weeks to complete the survey. The participants will be gathered from an email list that reaches all primary care providers (nurse practitioners, physician assistants and medical doctors) from each public primary care clinics.

Data Collection

Data will be collected, using REDCap, a secure online survey tool.

Data Analysis

The data will be analyzed by reviewing the survey. Based on the questions answers, the percentages will be collected from all the participants. With the percentages, the question to the research study will be given.

Chapter IV

Results, Discussion, Limitations and Conclusion

RESULTS

Upon approval from the university's Human Research Protection Office (HRPO) a recruitment letter, consent form, and link to survey was sent to the Medical Director of the Department of Family and Community Medicine, who forward it to other Medical Directors of UNM Primary Care Clinics. The survey was available for two weeks and at the end of the two weeks, there were a total of 10 surveys completed. Out of the 10 surveys two were incomplete. One survey did not complete question 3, which asked if they have patients diagnosed with diabetes under their care. The other did not complete question 10, which asked if they noticed a difference in the patient's diabetes management when having dental care. Only surveys completed fully were analyzed, thus research will be based on 8 participants (N=8).

Question number one of the survey asked the participants occupational title. This was a multiple-choice question. The number of Nurse Practitioners was 0% (n=0), Physician Assistants 37.5% (n=3), MD/DO 62.5% (n=5) or Other 0%(n=0). (Table 3)

	Nurse Practitioner	**Physician Assistant**	**MD/DO**	**Other**
Please select your title	0% (n=0)	37.5% (n=3)	62.5% (n=5)	0% (n=0)

Table 3: Participants Occupational Title

Question two asked how many years they have been in practice. This was a multiple-choice question. Options included 0-5 years, 6-10 years, 11-20 years, or 20 or more years. Results showed, 0-5 years 0% (n=0), 6-10 years 12.5% (n=1), 11-20 years 50% (n=4) and 20 or more years 37.5% (n=3). Overall, all participants have been in the medical practitioners for ten years and more. (Table 4)

	0-5 years	6-10 years	11-20 years	20 years or more
How many years have you been in practice?	0% (n=0)	12.5% (n=1)	50% (n=4)	37.5% (n=3)

Table 4: Years in Practice

Question three, asked whether they currently treat patients with diabetes mellitus and if so, which type. There were 87.5% (n=7) who answered yes and 12.5 % (n=1) who do not have patients diagnosed with diabetes under their care. If they answered yes, they had to choose the types of diabetes they have treated. In this section participants, could choose more than one option. The options were: pre-diabetes 75% (n=6), type 1 diabetes 75% (n=6), type 2 diabetes 75% (n=6), and gestational diabetes 75% (n=6). Overall, participants have treated patients with all four-type of diabetes. There was one participant who has not treated anyone with diabetes and another who has only treated patients with gestational diabetes and another who has treated all types of diabetes except gestational diabetes. (Table 5)

Do you currently have patients under your care who have been diagnosed with diabetes mellitus?	**Yes** 87.5% (n=7)		**No** 12.5% (n=1)
	Type of Diabetes		
	Pre-Diabetes	75% (n=6)	
	Type 1 Diabetes	75% (n=6)	
	Type 2 Diabetes	75% (n=6)	
	Gestational Diabetes	75% (n=6)	

Table 5: Types of Diabetes Participants Treat

Question 4 asked if education regarding the association between diabetes and oral health was given to their patients. This yes or no question was based on the response and there was a follow up question regarding the frequency or reason why it was not discussed. If they answered

yes the options were: at initial diagnosis, follow up appointment, or annually. If they answered no, the follow up options were: lack of time, lack of knowledge, this is delegated to another team member, or other. For all the options given, participants could choose multiple answers and write in their answer.

Results revealed 50% (n=4) did educate their patients and 50% (n=4) did not educate their patients. Those who indicated they provide education do so 25% (n=1) of the time at initial diagnosis, 25% (n=1) at follow up appointment and annually 37.5% (n=3). If the response was no, 25% (n=1) indicated lack of time, lack of knowledge (n=4), this is delegated to another team member (n=0), or other (n=2) (Table 6). Those who choose other indicated the following:

#1: "Lack of educational patient resources, lack of places to send patients to get dental care"

#2: "I think people have a lot of shame related to their lack of oral health and I frankly don't think that adding shame when they are already struggling to do basic diabetes medications is too much".

Do you provide education on the association between diabetes and oral health?	**Yes** 50% (n=4)		**No** 50% (n=4)	
	At initial diagnosis	(n=1)	**Lack of time**	(n=1)
	Follow up appointment	(n=1)	**Lack of knowledge**	(n=4)
	Annually	(n=3)	**This is delegated to another team member**	(n=0)
			Other	(n=2)

Table 6: Education on Association between Diabetes and Oral Health

Question five asked participants to rate their confidence when discussing the relationship between oral health and diabetes. Range was from1 being not confident at all to 5 being

extremely confident. Twenty five percent reported a 1 not confident at all, a 2 was 12.5%, 3 was 62.5% 4 was 0% and 5 was 0%. Overall, result show participants feel somewhat confident to not confident at all talking about the relationship between oral health and diabetes. (Table 7)

	1 (not confident at all)	**2**	**3**	**4**	**5 (extremely confident)**
How would you rate your confidence in discussing the relationship between diabetes and oral health?	25% (n=2)	12.5% (n=1)	62.5% (n=5)	0% (n=0)	0% (n=0)

Table 7: Confidence in Discussing Relationship between Diabetes and Oral Health

Question six asked, what level they prioritize patients with diabetes oral health status as part of their diabetes management plan. Not a priority 12.5% (n=1), low priority 12.5% (n=1), neutral 50% (n=4), moderate priority 12.5% (n=1) and high priority 12.5% (n=1). This shows there is a mixed option towards the importance of oral health in patients with diabetes in primary care providers. On the other hand, due to a small sample size, this cannot be generalized to the larger population. (Table 8)

	Not a Priority	**Low Priority**	**Neutral**	**Moderate Priority**	**High Priority**
At what level do you prioritize a patient's oral health status as part of their diabetes management plan?	12.5% (n=1)	12.5% (n=1)	50% (n=4)	12.5% (n=1)	12.5% (n=1)

Table 8: Prioritize Oral Health Status as Part of Diabetes Management Plan

Question seven asked, when would they recommend patients to seek a dental professional. In this question, participants could choose more than one answer. Never 62.5% (n=5), routinely at initial diagnosis 12.5% (n=1), at follow up appointment, 37.5% (n=3), when

patient expressed dental pain 12.5% (n=1) and upon patient request 25% (n=2). There was a higher percentage of never recommending a patient with diabetes to seek a dental professional for treatment. (Table 9)

	Never	Routinely at initial diagnosis	At follow-up appointments	When patient expressed dental pain	Upon patient request
When do you recommend a patient with diabetes seek a dental exam and cleaning	62.5% (n=5)	12.5% (n=1)	37.5% (n=3)	12.5% (n=1)	25.0% (n=2)

Table 9: Recommendation to Seek Dental Exam and Cleaning

Question eight asked the frequency of oral hygiene questions they received from patients with diabetes. Results indicated, never 37.5% (n=3), rarely 50% (n=4), neutral 0% (n=0), frequently 0% (n=0), every time 12.5% (n=1). Oral hygiene questions seem to not be asked to primary care providers. (Table 10)

	Never	Rarely	Neutral	Frequently	Every Time
How often do you get oral hygiene questions from your patients with diabetes?	37.5% (n=3)	50% (n=4)	0% (n=0)	0% (n=0)	12.5% (n=1)

Table 10: Oral Hygiene Questions from Patients with Diabetes

Question nine asked primary care providers to rate their confidence in discussing oral manifestations to their patients with diabetes. Not confident at all 37.5% (n=3), somewhat confident 12.5% (n=1), neutral 25% (n=2), confident 12.5% (n=1) and very confident 12.5% (n=1). Based on the small sample size there are more who are not so confident in the subject of oral manifestations with patients with diabetes. (Table 11)

	Not confident at all	Somewhat confident	Neutral	Confident	Very Confident
Rate your degree of confidence when discussing oral manifestations with diabetes to your patients?	37.5% (n=3)	12.5% (n=1)	25% (n=2)	12.5% (n=1)	12.5% (n=1)

Table 11: Confidence in Discussing Oral Manifestations with Diabetes

Finally question ten asks, if they have noticed a change in the patient's diabetes management on those who have regular access to dental care. Results revealed, never 37.5% (n=3), almost never 25% (n=2), occasionally 12.5% (n=1), almost every time 0% (n=0), every time 25% (n=2). Based on the results, there is a higher percentage with those who almost never or never see a difference in patient's diabetes management. As for those who see a change occasionally and every time were 3 participants out of 8. (Table12)

	Never	Almost Never	Occasionally	Almost Every Time	Every Time
Do you notice a positive difference in a patient's diabetes management when they regularly access dental care?	37.5% (n=3)	25% (n=2)	12.5% (n=1)	0% (n=0)	25.0% (n=2)

Table 12: Positive Difference in Diabetes Management with Regular Dental Care

DISCUSSION

Research survey was sent out to 10 primary care clinics within the UNM Health Science Center. The survey was estimated to reach approximately 130 primary care providers however; the response rate was low. The survey was sent via email with a direct link to access and collect data via RedCap. The survey was open for two weeks with no reminder email. At the end of the two weeks there were a total of 10 respondents. Two surveys were incomplete and had to be omitted. With such a small sample, this research study cannot provide us with conclusive information that can be generalized about the population. On the other hand, based on the results that were gathered there was some informative information given.

Based on the results gathered, primary care providers do not discuss oral hygiene to patients with diabetes due to a majority responding lack of knowledge and confidence in the subject. It also shows that if the patient does not bring up any concerns regarding oral hygiene, providers do not take interests it referring or discussing it. Oral hygiene is not a primary concern when it comes to the health of a patient with diabetes. Due to the small number of participants, the study is inconclusive and is not able to give accurate information.

LIMITATIONS

Limitations in this study are the low response rate. Due to low count rate, results cannot be used to compare with past research. Reasons for a low count result could be because, participants refused to take the survey based on the title, it was being taken and there may have been questions they were not comfortable in answering and they stopped taking it, or the email was not seen. It being a low number, there could have been another source where a higher rate of participants could take the survey. For example, Facebook, primary care association or a facility that had a list serve. Also, a reminder email to complete the survey after the first week and three

days prior to the closing date may have increased the response rate, along with leaving the survey open for longer than two weeks. Overall, this research study was inconclusive due to the small sample size.

CONCLUSION

Although there was not enough data to result in a generalizable conclusion, the respondents in the study suggested that oral health is not discussed by primary care providers to their patients with diabetes, patients are not being referred to a dental professional, and oral health is not at a high priority in routine examinations. Based on the answers, there is potential need for providers to increase their understanding of the relationship between oral health and diabetes, to increase their confidence in discussing the correlation of diabetes and oral health to their patients. This study also highlights the opportunity that exists for more inter-professional collaboration between medical and dental professionals. For this study's specific focus, more research should be performed to assess if oral hygiene is being discussed by primary care providers to patients diagnosed with diabetes.

CHAPTER V: SUBMISSION

American Diabetes Association Journal

An Assessment of Oral Health Discussion between Primary Care Providers and Their Patients with Diabetes

Discussion between Primary Care Providers Discussion between Oral Health and Diabetes

Authors:

Rocio Huizar, University of New Mexico, 505-681-1886, RHuizar@salud.unm.edu

Diana Aboytes, Department of Dental Medicine, School of Medicine, University of New Mexico, 505-272-3641, DAboytes@salud.unm.edu

Christine Nathe, Department of Dental Medicine, School of Medicine, University of New Mexico,505-272-8147, CNathe@salud.unm.edu

Lindsey Lee, Department of Dental Medicine, School of Medicine, University of New Mexico, 505-272-0838, Lindseylee@salud.unm.edu

Word count: 83

Tables: 10

ABSTRACT

Diabetes mellitus is a common chronic disease among all age groups. Oral health is important for everyone. However, many times individuals who are diagnosed with diabetes mellitus are not given information regarding the relationship between oral health and diabetes. The purpose of this study was to assess if primary care providers discuss the association between oral health and diabetes mellitus to their patients with diabetes. This included asking if primary care providers refer patients with diabetes to dental providers and where oral health is ranked in importance during a routine exam.

A survey was created and sent through a secure online survey tool to the Medical Director of the Department of Family and Community Medicine, to forward to providers in each primary care clinical facility. The survey was open for two weeks, a total of 10 respondents were collected. Two surveys were incomplete and not used for data analysis. Thus, results were taken from 8 participants. Results showed primary care providers do not regularly discuss the association between oral hygiene and diabetes. They are not confident in discussing oral manifestations associated with diabetes. Also, providers never recommend patients to seek dental treatment.

Introduction

Diabetes mellitus is one of the most common diseases among all age groups and is the seventh leading cause of death in the United States.[1,2] Diabetes is defined as a chronic disease where the body's blood has too much glucose due to inability of producing or using insulin to remove glucose from the blood.[1] Unfortunately, most individuals diagnosed with diabetes, are not aware that oral health has a direct relationship with diabetes.[3] It is important for primary care providers to discuss the importance of oral hygiene to their patients with diabetes. The purpose of this study is to assess whether primary care providers discuss the association between oral health and diabetes mellitus to their patients with diabetes, if they refer patients to dental providers, and where is oral health ranked in primary care providers' routine exam.

There is a strong correlation between periodontal disease and diabetes.[4,5,6] This strong correlation supports the need for dental and medical providers to address how these two diseases can negatively impact the other.[4] This inter-professional approach is needed due to the bidirectional relationship of the two disease and also due to trends in health care access.[4] Dental hygienists educate their patients regularly on the prevention and maintenance of periodontal disease, however many patients with periodontal disease or dental related issues are not solely coming to dental offices, but medical offices instead.[7] Additionally, patients with diabetes are recommended to routinely see their primary care providers as part of their diabetes management plan. Patients with diabetes have a high prevalence of having periodontal disease, increasing the importance for primary care providers to discuss oral health strategies and oral disease prevention with their patients with diabetes.

RESEARCH DESIGN AND METHODS

This study consisted of a convenience sample of primary care providers, including nurse practitioners, physician assistants and medical doctors. Upon approval of the institutional review board, they were surveyed regarding the information they provide patients regarding dental health. Data was collected using REDCap, a secure online survey tool. The data will be analyzed by reviewing the survey. Based on the questions answers, the percentages will be collected from all the participants. With the percentages, the question to the research study will be given.

RESULTS

Upon approval from the university's Human Research Protection Office (HRPO) a recruitment letter, consent form, and link to survey was sent to the Medical Director of the Department of Family and Community Medicine, who forward it to other Medical Directors of UNM Primary Care Clinics. The survey was available for two weeks and at the end of the two weeks, there were a total of 10 surveys completed. Out of the 10 surveys two were incomplete. One survey did not complete question 3, which asked if they have patients diagnosed with diabetes under their care. The other did not complete question 10, which asked if they noticed a difference in the patient's diabetes management when having dental care. Only surveys completed fully were analyzed, thus research will be based on 8 participants (N=8).

Question number one of the survey asked the participants occupational title. This was a multiple-choice question. The number of Nurse Practitioners was 0% (n=0), Physician Assistants 37.5% (n=3), MD/DO 62.5% (n=5) or Other 0%(n=0). (Table 1)

Question two asked how many years they have been in practice. This was a multiple-choice question. Options included, 0-5 years, 6-10 years, 11-20 years, or 20 or more years. Results showed, 0-5 years 0% (n=0), 6-10 years 12.5% (n=1), 11-20 years 50% (n=4) and 20 or

more years 37.5% (n=3). Overall, all participants have been in the medical practitioners for ten years and more. (Table 2)

Question three, asked whether they currently treat patients with diabetes mellitus and if so, which type. There were 87.5% (n=7) who answered yes and 12.5 % (n=1) who do not have patients diagnosed with diabetes under their care. If they answered yes, they had to choose the types of diabetes they have treated. In this section participants, could choose more than one option. The options were: pre-diabetes 75% (n=6), type 1 diabetes 75% (n=6), type 2 diabetes 75% (n=6), and gestational diabetes 75% (n=6). Overall, participants have treated patients with all four-type of diabetes. There was one participant who has not treated anyone with diabetes and another who has only treated patients with gestational diabetes and another who has treated all types of diabetes except gestational diabetes. (Table 3)

Question 4 asked if education regarding the association between diabetes and oral health was given to their patients. This yes or no question was based on the response and there was a follow up question regarding the frequency or reason why it was not discussed. If they answered yes the options were: at initial diagnosis, follow up appointment, or annually. If they answered no, the follow up options were: lack of time, lack of knowledge, this is delegated to another team member, or other. For all the options given, participants could choose multiple answers and write in their answer.

Results revealed 50% (n=4) did educate their patients and 50% (n=4) did not educate their patients. Those who indicated they provide education do so 25% (n=1) of the time at initial diagnosis, 25% (n=1) at follow up appointment and annually 37.5% (n=3). If the response was no, 25% (n=1) indicated lack of time, lack of knowledge (n=4), this is delegated to another team member (n=0), or other (n=2) (Table 4). Those who choose other indicated the following:

#1: “Lack of educational patient resources, lack of places to send patients to get dental care” #2: “I think people have a lot of shame related to their lack of oral health and I frankly don’t think that adding shame when they are already struggling to do basic diabetes medications is too much”.

Question five asked participants to rate their confidence when discussing the relationship between oral health and diabetes. Range was from1 being not confident at all to 5 being extremely confident. Twenty five percent reported a 1 not confident at all, a 2 was 12.5%, 3 was 62.5% 4 was 0% and 5 was 0%. Overall, result show participants feel somewhat confident to not confident at all talking about the relationship between oral health and diabetes. (Table 5)

Question six asked, what level they prioritize patients with diabetes oral health status as part of their diabetes management plan. Not a priority 12.5% (n=1), low priority 12.5% (n=1), neutral 50% (n=4), moderate priority 12.5% (n=1) and high priority 12.5% (n=1). This shows there is a mixed option towards the importance of oral health in patients with diabetes in primary care providers. On the other hand, due to a small sample size, this cannot be generalized to the larger population. (Table 6)

Question seven asked, when would they recommend patients to seek a dental professional. In this question, participants could choose more than one answer. Never 62.5% (n=5), Routinely at initial diagnosis 12.5%(n=1), at follow up appointment, 37.5% (n=3), when patient expressed dental pain 12.5% (n=1) and upon patient request 25% (n=2). There was a higher percentage of never recommending a patient with diabetes to seek a dental professional for treatment. (Table 7)

Question eight asked the frequency of oral hygiene questions they received from patients with diabetes. Results indicated, never 37.5% (n=3), rarely 50% (n=4), neutral 0% (n=0),

frequently 0% (n=0), every time 12.5% (n=1). Oral hygiene questions seem to not be asked to primary care providers. (Table 8)

Question nine asked primary care providers to rate their confidence in discussing oral manifestations to their patients with diabetes. Not confident at all 37.5% (n=3), somewhat confident 12.5% (n=1), neutral 25% (n=2), confident 12.5% (n=1) and very confident 12.5% (n=1). Based on the small sample size there are more who are not so confident in the subject of oral manifestations with patients with diabetes. (Table 9)

Finally question ten asks, if they have noticed a change in the patient's diabetes management on those who have regular access to dental care. Results revealed, never 37.5% (n=3), almost never 25% (n=2), occasionally 12.5% (n=1), almost every time 0% (n=0), every time 25% (n=2). Based on the results, there is a higher percentage with those who almost never or never see a difference in patient's diabetes management. As for those who see a change occasionally and every time were 3 participants out of 8. (Table10)

DISCUSSION

Research survey was sent out to 10 primary care clinics within the UNM Health Science Center. The survey was estimated to reach approximately 130 primary care providers however; the response rate was low. The survey was sent via email with a direct link to access and collect data via RedCap. The survey was open for two weeks with no reminder email. At the end of the two weeks there were a total of 10 respondents. Two surveys were incomplete and had to be omitted. With such a small sample, this research study cannot provide us with conclusive information that can be generalized about the population. On the other hand, based on the results that were gathered there was some informative information given.

Based on the results gathered, primary care providers do not discuss oral hygiene to patients with diabetes due to a majority responding lack of knowledge and confidence in the subject. It also shows that if the patient does not bring up any concerns regarding oral hygiene, providers do not take interests it referring or discussing it. Oral hygiene is not a primary concern when it comes to the health of a patient with diabetes. Due to the small number of participants, the study is inconclusive and is not able to give accurate information.

REFERENCES

1. Stöppler, M. C. (n.d.). 9 Symptoms of Type 1 & Type 2 Diabetes: Treatment, Causes & Diet (W. C. Shiel Jr., Ed.). Retrieved May 29, 2019, from https://www.medicinenet.com/diabetes_mellitus/article.htm#diabetes_type_1_and_type_2_definition_and_facts
2. About Prediabetes and Type 2 Diabetes | National Diabetes Prevention Program | Diabetes | CDC. (n.d.). Retrieved May 29, 2019, from https://www.cdc.gov/diabetes/prevention/lifestyle-program/about-prediabetes.html?CDC_AA_refVal=https://www.cdc.gov/diabetes/prevention/prediabetes-type2/index.html
3. Shimpi, N., Glurich, I., Schroeder, D., Katrak, C., Chyou, P. H., & Acharya, A. (2018). Patient Awareness of Association of Diabetes and Periodontal Disease. *Health promotion practice*, 1524839918801909.
4. Kane, S.F, (2017). The effects of oral health on systemic health. *Academy of General Dentistry, 411,* 30-35.
5. Preshaw, P. M., Alba, A. L., Herrera, D., Jepsen, S., Konstantinidis, A., Makrilakis, K., & Taylor, R. (2012). Periodontitis and diabetes: a two-way relationship. *Diabetologia*, *55*(1), 21-31.
6. Indurkar, M. S., Maurya, A. S., & Indurkar, S. (2016). Oral manifestations of diabetes. *Clinical Diabetes*, *34*(1), 54-57.
7. Cohen, L. A. (2013). Expanding the Physician's Role in Addressing the Oral Health of Adults. *American Journal of Public Health*, *103*(3), 408–412.
8. Prediabetes. (2017). Retrieved May 29, 2019, from https://www.mayoclinic.org/diseases-conditions/prediabetes/symptoms-causes/syc-20355278
9. Type 1 diabetes. (2017). Retrieved May 30, 2019, from https://www.mayoclinic.org/diseases-conditions/type-1-diabetes/symptoms-causes/syc-20353011
10. Type 2 diabetes. (2019). Retrieved May 30, 2019, from https://www.mayoclinic.org/diseases-conditions/type-2-diabetes/symptoms-causes/syc-20351193
11. Gestational diabetes. (2017). Retrieved May 29, 2019, from https://www.mayoclinic.org/diseases-conditions/gestational-diabetes/symptoms-causes/syc-20355339
12. Glossary of Dental Clinical and Administrative Terms. (n.d.). Retrieved May 29, 2019, from https://www.ada.org/en/publications/cdt/glossary-of-dental-clinical-and-administrative-ter#g
13. Glossary of Dental Clinical and Administrative Terms. (n.d.). Retrieved May 29, 2019, from https://www.ada.org/en/publications/cdt/glossary-of-dental-clinical-and-administrative-ter#p
14. What Everyone Needs to Know About Prediabetes. (2015). Retrieved May 29, 2019, from https://diatribe.org/what-everyone-needs-know-about-prediabetes
15. Type 1 Diabetes | Basics | Diabetes | CDC. (n.d.). Retrieved July 23, 2019, from https://www.cdc.gov/diabetes/basics/type1.html
16. Type 2 Diabetes | Basics | Diabetes | CDC. (n.d.). Retrieved July 23, 2019, from https://www.cdc.gov/diabetes/basics/type2.html

17. Periodontal Disease Fact Sheet. (n.d.). Retrieved May 29, 2019, from https://www.perio.org/newsroom/periodontal-disease-fact-sheet
18. Types of Gum Disease. (n.d.). Retrieved May 29, 2019, from https://www.perio.org/consumer/types-gum-disease.html
19. Walsh, M. M., & Darby, M. L. (2015). Chapter 19: Periodontal and Risk Assessment. S.L. Tolle (Ed.), Dental hygiene: Theory and practice (4th ed., pp 324). St. Louis, MO: Elsevier Saunders.
20. Yadav, B., Mody, B., Lakhanpal, M., Suma, G. N., & Aggarwal, P. (2014). Change in the Frequency of occurrence in the Oral Manifestations between Controlled and Uncontrolled Type 1 & Type 2 Diabetes Mellitus- A Pilot Study. *Journal of Dental Specialties*, *2*(2), 39.
21. Lopes, C. C. P., Busato, P. D. M. R., Mânica, M. F. M., de Araújo, M. C., Zampiva, M. M. M., Bortolini, B. M., & Nassar, P. O. (2017). Effect of basic periodontal treatment on glycemic control and inflammation in patients with diabetes mellitus type 1 and type 2: controlled clinical trial. *Journal of Public Health*, *25*(4), 443-449.
22. Hemoglobin A1c (HbA1c) Test for Diabetes. (n.d.). Retrieved May 29, 2019, from https://www.webmd.com/diabetes/guide/glycated-hemoglobin-test-hba1c
23. Carboneau, B. A. (2017). *Regulation of β-Cell Mass Expansion by Prostaglandin E 2 Signaling* (Doctoral dissertation, Vanderbilt University).
24. Munjal, A., Jain, Y., Kote, S., Krishnan, V., Fahim, R., Metha, S. S., & Passi, D. (2019). A study on the change in HbA1c levels before and after non-surgical periodontal therapy in type-2 diabetes mellitus in generalized periodontitis. *Journal of family medicine and primary care*, *8*(4), 1326.
25. Dental Care and Diabetes. (2017). Retrieved May 29, 2019, from https://www.webmd.com/diabetes/dental-health-dental-care-diabetes
26. Ramirez, J. H., Arce, R., & Contreras, A. (2010). Why must physicians know about oral diseases?. *Teaching and learning in medicine*, *22*(2), 148-155.
27. Al-Habashneh, R., Barghout, N., Humbert, L., Khader, Y., & Alwaeli, H. (2010). Diabetes and oral health: doctors' knowledge, perception and practices. *Journal of evaluation in clinical practice*, *16*(5), 976-980.
28. Vellayappan, R., & Varghese, S. S. (2017). A survey on knowledge, attitude and practice among the doctors towards systemic health possibly influenced by periodontitis. *International Journal of Applied Dental Sciences*, *3*(2), 190-192.
29. Smith, R. M., Fleming, L. E., Arheart, K. L., & Wilkinson, J. D. (2007). Periodontal disease and diabetes: Knowledge and attitudes assessment project. *Florida Public Health Review*, *4*, 12-17.

TABLES

	Nurse Practitioner	Physician Assistant	MD/DO	Other
Please select your title.	0% (n=0)	37.5% (n=3)	62.5% (n=5)	0% (n=0)

Table 1: Participants Occupational Title

	0-5 years	6-10 years	11-20 years	20 years or more
How many years have you been in practice?	0% (n=0)	12.5% (n=1)	50% (n=4)	37.5% (n=3)

Table 2: Years in Practice

Do you currently have patients under your care who have been diagnosed with diabetes mellitus?	**Yes** 87.5% (n=7)		**No** 12.5% (n=1)
	Type of Diabetes		
	Pre-Diabetes	75% (n=6)	
	Type 1 Diabetes	75% (n=6)	
	Type 2 Diabetes	75% (n=6)	
	Gestational Diabetes	75% (n=6)	

Table 3: Types of Diabetes Participants Treat

Do you provide education on the association between diabetes and oral health?	**Yes** 50% (n=4)		**No** 50% (n=4)	
	At initial diagnosis	(n=1)	**Lack of time**	(n=1)
	Follow up appointment	(n=1)	**Lack of knowledge**	(n=4)
	Annually	(n=3)	**This is delegated to another team member**	(n=0)
			Other	(n=2)

Table 4: Education on Association Between Diabetes and Oral Health

	1 (not confident at all)	**2**	**3**	**4**	**5 (extremely confident)**
How would you rate your confidence in discussing the relationship between diabetes and oral health?	25% (n=2)	12.5% (n=1)	62.5% (n=5)	0% (n=0)	0% (n=0)

Table 5: Confidence in Discussing Relationship between Diabetes and Oral Health

	Not a Priority	**Low Priority**	**Neutral**	**Moderate Priority**	**High Priority**
At what level do you prioritize a patient's oral health status as part of their diabetes management plan?	12.5% (n=1)	12.5% (n=1)	50% (n=4)	12.5% (n=1)	12.5% (n=1)

Table 6: Prioritize Oral Health Status as Part of Diabetes Management Plan

	Never	Routinely at initial diagnosis	At follow-up appointments	When patient expressed dental pain	Upon patient request
When do you recommend a patient with diabetes seek a dental exam and cleaning	62.5% (n=5)	12.5% (n=1)	37.5% (n=3)	12.5% (n=1)	25.0% (n=2)

Table 7: Recommendation to Seek Dental Exam and Cleaning

	Never	Rarely	Neutral	Frequently	Every Time
How often do you get oral hygiene questions from your patients with diabetes?	37.5% (n=3)	50% (n=4)	0% (n=0)	0% (n=0)	12.5% (n=1)

Table 8: Oral Hygiene Questions from Patients with Diabetes

	Not confident at all	Somewhat confident	Neutral	Confident	Very Confident
Rate your degree of confidence when discussing oral manifestations with diabetes to your patients?	37.5% (n=3)	12.5% (n=1)	25% (n=2)	12.5% (n=1)	12.5% (n=1)

Table 9: Confidence in Discussing Oral Manifestations with Diabetes

	Never	Almost Never	Occasionally	Almost Every Time	Every Time
Do you notice a positive difference in a patient's diabetes management when they regularly access dental care?	37.5% (n=3)	25% (n=2)	12.5% (n=1)	0% (n=0)	25.0% (n=2)

Table 10: Positive Difference in Diabetes Management with Regular Dental Care

APPENDIX A

HRPO APPROVAL LETTER

Human Research Protections Program

November 13, 2019

Diana Aboytes
DAboytes@salud.unm.edu

Dear Diana Aboytes:

On 11/11/2019, the HRRC reviewed the following submission:

Type of Review:	Modification
Title of Study:	An Assessment of Oral Health Discussion Between Primary Care Providers and Their Patients with Diabetes
Investigator:	Diana Aboytes
Study ID:	19-448
Submission ID:	MOD00010608
IND, IDE, or HDE:	None
Submission Summary:	Modification #1 for Study 19-448 to revise Survey.
Documents Approved:	• Survey RHuizar_2.pdf
Review Category:	EXEMPTION: Categories (2)(i) Tests, surveys, interviews, or observation (non-identifiable)
Determinations/Waivers:	Provisions for Consent are adequate. HIPAA Authorization Addendum Not Applicable. Re-consent is not required.
Submission Approval Date:	11/11/2019
Approval End Date:	None
Effective Date:	**11**/11/**2019**

The HRRC approved the study from 11/11/2019 to inclusive. If modifications were required to secure approval, the effective date will be later than the approval date. The "Effective Date" 11/11/2019 is the date the HRRC approved your modifications and, in all cases, represents the date study activities may begin.

Because it has been granted exemption, this research is not subject to continuing review.

Please use the consent documents that were approved by the HRRC. The approved consents are available for your retrieval in the "Documents" tab of the parent study.

If the study meets the definition of an NIH Clinical Trial, the study must be registered in the ClinicalTrials.gov database. Additionally, the approved consent document(s) must be uploaded to the ClinicalTrials.gov database.

HEALTH SCIENCES
OFFICE OF RESEARCH

As a reminder, it is the responsibility of the principal investigator or delegated study team member, to re-consent former and/or current participants as directed in the "Determinations/Waivers" section of this letter.

This determination applies only to the activities described in this submission and does not apply should you make any changes to these documents. If changes are being considered these must be submitted for review in a study modification to the HRRC for a determination prior to implementation. If there are questions about whether HRRC review is needed, contact the HRPO before implementing changes without approval. A change in the research may disqualify this research from the current review category. You can create a modification by clicking Create Modification / CR within the study.

If your submission indicates you will translate materials post-approval of English materials, you may not recruit or enroll participants in another language, until all translated materials are reviewed and approved.

In conducting this study, you are required to follow the Investigator Manual (HRP-103), which can be found by navigating to the IRB Library.

Sincerely,

Thomas F. Byrd, MD
HRRC Executive Chair

APPENDIX B
INFORMED CONSENT

Template v5/23/2019

The University of New Mexico Health Sciences Center

Consent and Authorization to Participate in a Research Study

Dear Prospective Participant,

Researchers at the University of New Mexico are inviting you to take part in questionnaire about whether primary care providers within the University of New Mexico discuss the association between oral health and diabetes mellitus with their patients, if they refer patients to a dental provider and where oral health is ranked during a routine examination. You are being asked to participate in this study because you are primary care providers who have or may have treated patients with diabetes.

WHAT ARE THE KEY REASONS YOU MIGHT CHOOSE TO VOLUNTEER FOR THIS STUDY?
Although you may not get personal benefit from taking part in this research study, your responses may help us understand more about the need for more integration between oral health providers and primary care providers especially for patient who suffer with diabetes mellitus.

WHAT ARE THE KEY REASONS YOU MIGHT NOT CHOOSE TO VOLUNTEER FOR THIS STUDY?
The survey/questionnaire will take about 10 minutes to complete.

Although we have tried to minimize this, some questions may make you upset or feel uncomfortable and you may choose not to answer them. If some questions do upset you, we can tell you about some people who may be able to help you with these feelings. There is a risk of loss of confidentiality.

Your response to the survey is anonymous which means no names will appear or be used on research documents, or be used in presentations or publications. The research team will not know that any information you provided came from you, nor even whether you participated in the study. All data will be kept for 3 years in a locked file in Diana Aboytes's office and then destroyed.

We hope to receive completed questionnaires from about 100 people, so your answers are important to us. Of course, you have a choice about whether or not to complete the survey/questionnaire, but if you do participate, you are free to skip any questions or discontinue at any time.

Please be aware, while we make every effort to safeguard your data once received from the online survey company, given the nature of online surveys, as with anything involving the Internet, we can never guarantee the confidentiality of the data while still on the survey company's servers, or during transmission to either them or us. It is also possible the raw data collected for research purposes will be used for marketing or reporting purposes by the survey/data gathering company after the research is concluded, depending on the company's Terms of Service and Privacy policies.

If you have questions about the study, please feel free to ask; my contact information is given below. If you have questions regarding your legal rights as a research subject, you may call the UNM Human Research Protections Office at (505) 272-1129.
Thank you in advance for your assistance with this important project. To ensure your responses/opinions will be included, please complete survey/questionnaire by October 25, 2019. By clicking on the link below, you will be agreeing to participate in the above described research study.

Sincerely,

Rocio Huizar,RDH, MSDH Candidate
Diana Aboytes, RDH, MS Principal Investigator
Dental Medicine/Dental Hygiene, University of New Mexico Health Sciences
PHONE: 505-272-4513
E-MAIL: RHuizar@salud.unm.edu or DAboytes@salud.unm.edu

HRRC# <19-448> version date: <9-23-19>

APPENDIX C
RECRUITMENT LETTER

Hello UNM Health Science Center Primary Care Providers,

Graduate student, Rocio Huizar RDH, along with her PI, Diana Aboytes, RDH, MS from the UNM Department of Dental Medicine, is conducting a descriptive research study using a short (~10 min.) survey.

The purpose of the study is to assess whether primary care providers within the University of New Mexico discuss the association between oral health and diabetes mellitus with their patients, if they refer patients to a dental provider and where oral health is ranked during a routine examination.

Participation is voluntary and all responses will remain anonymous. In order to participate, click on attached link.

Any questions you may contact Rocio Huizar, RDH, MSDH Candidate at (505) 681-1886, the PI Diana Aboytes, RDH, MS, Associate Professor, Dental Hygiene 505-272-4513. DAboytes@salud.unm.edu or the HRPO office at 272-1129.

Thank you.

APPENDIX D
SURVEY

1. Please select your title.
    a. Nurse Practitioner
    b. Physician Assistant
    c. MD/DO
    d. Other
2. How many years have you been in practice?
    a. 0-5 years
    b. 6-10 years
    c. 11-20 years
    d. 20 or more years
3. Do you currently have patients under your care who have been diagnosed with diabetes mellitus?
    a. Yes
    b. No

    If they answered YES:

    Choose all that apply:
    - Pre-diabetes
    - Type 1 diabetes
    - Type 2 diabetes
    - Gestational diabetes
4. Do you provide education on the association between diabetes and oral health?
    a. Yes
    b. No

    4a. Yes: Please indicate frequency. (Mark all that apply)
    - At initial diagnosis
    - Follow up appointment
    - Annually

    4b. No: Identify barriers in discussing the association
    - Lack of time
    - Lack of knowledge
    - This is delegated to another team member
    - Other:
5. How would you rate your confidence in discussing the relationship between diabetes and oral health? (1 = Not confident at all, 5= Extremely confident)
    a. 1
    b. 2
    c. 3
    d. 4
    e. 5
6. At what level do you prioritize a patient's oral health status as part of their diabetes management plan?
    a. Not a priority
    b. Low priority

    c. Neutral
    d. Moderate priority
    e. High priority
7. When do you to recommend a patient with diabetes seek a dental exam and cleaning? (Mark all that apply)
    a. Never
    b. Routinely at initial diagnosis
    c. At follow-up appointments
    d. When patient expresses dental pain
    e. Upon patient request
8. How often do you get oral hygiene questions from your patients with diabetes?
    a. Never
    b. Rarely
    c. Neutral
    d. Frequently
    e. Every time
9. Rate your degree of confidence when discussing oral manifestations with diabetes to your patients?
    a. Not confident at all
    b. Somewhat confident
    c. Neutral
    d. Confident
    e. Very confident
10. Do you notice a positive difference in a patient's diabetes management when they regularly access dental care?
    a. Never
    b. Almost never
    c. Occasionally
    d. Almost every time
    e. Every time

REFERENCES

1. Stöppler, M. C. (n.d.). 9 Symptoms of Type 1 & Type 2 Diabetes: Treatment, Causes & Diet (W. C. Shiel Jr., Ed.). Retrieved May 29, 2019, from https://www.medicinenet.com/diabetes_mellitus/article.htm#diabetes_type_1_and_type_2_definition_and_facts
2. About Prediabetes and Type 2 Diabetes | National Diabetes Prevention Program | Diabetes | CDC. (n.d.). Retrieved May 29, 2019, from https://www.cdc.gov/diabetes/prevention/lifestyle-program/about-prediabetes.html?CDC_AA_refVal=https://www.cdc.gov/diabetes/prevention/prediabetes-type2/index.html
3. Shimpi, N., Glurich, I., Schroeder, D., Katrak, C., Chyou, P. H., & Acharya, A. (2018). Patient Awareness of Association of Diabetes and Periodontal Disease. *Health promotion practice*, 1524839918801909.
4. Kane, S.F, (2017). The effects of oral health on systemic health. *Academy of General Dentistry, 411,* 30-35.
5. Preshaw, P. M., Alba, A. L., Herrera, D., Jepsen, S., Konstantinidis, A., Makrilakis, K., & Taylor, R. (2012). Periodontitis and diabetes: a two-way relationship. *Diabetologia*, *55*(1), 21-31.
6. Indurkar, M. S., Maurya, A. S., & Indurkar, S. (2016). Oral manifestations of diabetes. *Clinical Diabetes*, *34*(1), 54-57.
7. Cohen, L. A. (2013). Expanding the Physician's Role in Addressing the Oral Health of Adults. *American Journal of Public Health*, *103*(3), 408–412.

8. Prediabetes. (2017). Retrieved May 29, 2019, from https://www.mayoclinic.org/diseases-conditions/prediabetes/symptoms-causes/syc-20355278
9. Type 1 diabetes. (2017). Retrieved May 30, 2019, from https://www.mayoclinic.org/diseases-conditions/type-1-diabetes/symptoms-causes/syc-20353011
10. Type 2 diabetes. (2019). Retrieved May 30, 2019, from https://www.mayoclinic.org/diseases-conditions/type-2-diabetes/symptoms-causes/syc-20351193
11. Gestational diabetes. (2017). Retrieved May 29, 2019, from https://www.mayoclinic.org/diseases-conditions/gestational-diabetes/symptoms-causes/syc-20355339
12. Glossary of Dental Clinical and Administrative Terms. (n.d.). Retrieved May 29, 2019, from https://www.ada.org/en/publications/cdt/glossary-of-dental-clinical-and-administrative-ter#g
13. Glossary of Dental Clinical and Administrative Terms. (n.d.). Retrieved May 29, 2019, from https://www.ada.org/en/publications/cdt/glossary-of-dental-clinical-and-administrative-ter#p
14. What Everyone Needs to Know About Prediabetes. (2015). Retrieved May 29, 2019, from https://diatribe.org/what-everyone-needs-know-about-prediabetes
15. Type 1 Diabetes | Basics | Diabetes | CDC. (n.d.). Retrieved July 23, 2019, from https://www.cdc.gov/diabetes/basics/type1.html
16. Type 2 Diabetes | Basics | Diabetes | CDC. (n.d.). Retrieved July 23, 2019, from https://www.cdc.gov/diabetes/basics/type2.html

17. Periodontal Disease Fact Sheet. (n.d.). Retrieved May 29, 2019, from https://www.perio.org/newsroom/periodontal-disease-fact-sheet
18. Types of Gum Disease. (n.d.). Retrieved May 29, 2019, from https://www.perio.org/consumer/types-gum-disease.html
19. Walsh, M. M., & Darby, M. L. (2015). Chapter 19: Periodontal and Risk Assessment. S.L. Tolle (Ed.), Dental hygiene: Theory and practice (4th ed., pp 324). St. Louis, MO: Elsevier Saunders.
20. Yadav, B., Mody, B., Lakhanpal, M., Suma, G. N., & Aggarwal, P. (2014). Change in the Frequency of occurrence in the Oral Manifestations between Controlled and Uncontrolled Type 1 & Type 2 Diabetes Mellitus- A Pilot Study. *Journal of Dental Specialties*, *2*(2), 39.
21. Lopes, C. C. P., Busato, P. D. M. R., Mânica, M. F. M., de Araújo, M. C., Zampiva, M. M. M., Bortolini, B. M., & Nassar, P. O. (2017). Effect of basic periodontal treatment on glycemic control and inflammation in patients with diabetes mellitus type 1 and type 2: controlled clinical trial. *Journal of Public Health*, *25*(4), 443-449.
22. Hemoglobin A1c (HbA1c) Test for Diabetes. (n.d.). Retrieved May 29, 2019, from https://www.webmd.com/diabetes/guide/glycated-hemoglobin-test-hba1c
23. Carboneau, B. A. (2017). *Regulation of β-Cell Mass Expansion by Prostaglandin E 2 Signaling* (Doctoral dissertation, Vanderbilt University).
24. Munjal, A., Jain, Y., Kote, S., Krishnan, V., Fahim, R., Metha, S. S., & Passi, D. (2019). A study on the change in HbA1c levels before and after non-surgical periodontal therapy in type-2 diabetes mellitus in generalized periodontitis. *Journal of family medicine and primary care*, *8*(4), 1326.

25. Dental Care and Diabetes. (2017). Retrieved May 29, 2019, from https://www.webmd.com/diabetes/dental-health-dental-care-diabetes
26. Ramirez, J. H., Arce, R., & Contreras, A. (2010). Why must physicians know about oral diseases?. *Teaching and learning in medicine*, *22*(2), 148-155.
27. Al-Habashneh, R., Barghout, N., Humbert, L., Khader, Y., & Alwaeli, H. (2010). Diabetes and oral health: doctors' knowledge, perception and practices. *Journal of evaluation in clinical practice*, *16*(5), 976-980.
28. Vellayappan, R., & Varghese, S. S. (2017). A survey on knowledge, attitude and practice among the doctors towards systemic health possibly influenced by periodontitis. *International Journal of Applied Dental Sciences*, *3*(2), 190-192.
29. Smith, R. M., Fleming, L. E., Arheart, K. L., & Wilkinson, J. D. (2007). Periodontal disease and diabetes: Knowledge and attitudes assessment project. *Florida Public Health Review*, *4*, 12-17.