
Bacterial Oral Flora in diabetic and non diabetic patients

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Abstract:

Diabetes mellitus is a common and growing global health problem leading to several complications. Twenty two saliva samples were aseptically collected and cultured from patients at a public health clinic at Ismailia city, Egypt. Gram positive non spore forming bacilli were detected in 27 per cent of samples in two populations consisting of sixteen diabetic patients (three patients of type 1 and thirteen patients of type 2) and six non diabetic patients. *Bacillus subtilis*, *Streptococcus pyogenes* (Group A streptococcus), *Streptococcus agalactia* (Group B streptococcus), and *Enterococcus faecalis* were isolated from diabetic patients by 36 %, 13%, 4% and 4% respectively. *Pseudomonas aeruginosa* was detected in four per cent in non diabetic patients.

Introduction

Diabetes mellitus (DM) is a chronic metabolic disorder affecting children and adolescents and this kind called Type 1 diabetes, which occurs when the pancreas is unable to produce insulin. Insulin is a hormone that controls the amount of glucose (sugar) in the blood. Other type called type 2 diabetes, which occurs when the pancreas does not produce enough insulin or when the body does not effectively use the insulin that is produced. Type 2 diabetes usually develops in adulthood.

People with diabetes are prone to a variety of infections, including gum disease. Oral infections can make difficult to control diabetes and cause complications, since the bacteria from severe gum disease may increase both blood sugar

levels and the length of time the body struggles with high blood sugar (*Desvarieux et al, 2005*).

The incidence of periodontitis has been shown to increase among diabetic subjects after puberty and as the patients' population ages. Periodontal disease may be more frequent and severe in diabetic individuals with more advanced system complications (*Fiehn et al, 2005*).

The link between periodontal disease and systemic conditions has been evoked. The most of evidence suggests that diabetes increases the risk for gingivitis and periodontitis (*Papapanou, 1996 and Mealey and Moritz, 2003*). A case-control study confirmed that attachment loss is more prevalent and extensive in children with diabetes than in children without diabetes (*Lalla et*

al, 2006). In addition, epidemiologic search supports an increased prevalence and severity of attachment loss and bone loss in adults with diabetes (Persson, 2006). Furthermore, an increased incidence of dental caries in association with poorly controlled diabetes has also been reported (Jones et al. 1992 and Narhi et al, 1996), particularly in the elderly diabetic population.

Materials and Methods:

Bacteriological investigation was performed on 22 patients at public health clinic of diabetes Ismailia city, Egypt. Sixteen diabetic patients (3 patients of type 1 and 13 patients of type 2) and 6 non diabetic patients were investigated for bacterial oral infections. 4 male and 18 female patients participated in the study. Samples were collected by sterile cotton swap tool with complete aseptic precautions. Samples were inoculated onto nutrient agar, Blood agar and MacConkey's agar plates. All the plates were incubated at 37°C for 24-72 hours (Beighton and Lynch, 1995). Colonies with different characteristics were bacteriologically examined. Identification was based on colony morphology, urease, gram stain reaction, and biochemical tests including catalase, oxidase, indole and fermentation of sugars (Levin et al, 1996).

Results

This study shows that, the percentage of bacterial positive of human cases was higher in diabetic patients than in non diabetic. Almost the diabetic patients were (100%) infected with oral bacteria. While in of non diabetic patients, the infection rate was 66%.

Both diabetic and non diabetic male patients were totally infected (100%) with oral bacteria. Female diabetic patients had higher infection percentage than the non diabetic ones with 100% and 75% respectively (Table 1).

(Table 2) represents that 20 bacterial species were isolated from diabetic and non diabetic patients, in which 18 species were isolated from diabetic (16) and 2 species from non diabetic (6) from cases of dental caries. 84% gram positive bacteria were found in diabetic and non diabetic in which 80% and 4% respectively. The commonest bacteria isolated were *Bacillus sp* (36%), Gram positive bacilli non spore forming (23%) and *Streptococcus pyogenes* (Group A streptococcus (13%) from diabetic patients. while *Streptococcus agalactia* (4%) (Group B streptococcus) and *Enterococcus faecalis* (4%) had low occurrence in diabetics. Both gram positive bacilli non spore forming and *Pseudomonas sp* as gram negative bacilli formed 8% occurrence in non diabetics

Table 1: Number and percentage of bacterial isolates in diabetic & non-diabetic patients

Category of patients	No. of examined oral samples	No. of + ve %
Diabetic (DM)	16	16 (100%)
Non-diabetic (NDM)	6	4 (66%)
Male DM	2	2 (100%)
Male NDM	2	2 (100%)
Female DM	14	14 (100%)
Female NDM	4	3 (75%)

Table 2: number and percentage of oral bacterial flora from diabetic (DM) and non diabetic patients (NDM).

Bacterial Species	Number and percentage of isolated bacteria	
	DM (16) No. %	NDM (6) No. %
Gram positive bacteria	18 80	
<i>Streptococcus pyogenes</i> (Group A streptococcus)	3 13	-
<i>Streptococcus agalactia</i> (Group B streptococcus)	1 4	-
<i>Enterococcus faecalis</i>	1 4	-

Table 2 continued: Isolation frequency of swap oral bacterial flora from diabetic (DM) and non diabetic patients (NDM).

Species name	Number and percentage of isolated bacteria	
	DM (16) No. %	NDM (6) No. %
<i>Bacillus subtilis</i>	8 36	-
Gram positive bacilli non spore forming	5 23	1 4
Gram negative bacteria		
<i>Pseudomonas aeruginosa</i>	-	1 4
Total	18 80	2 8

Discussion

Diabetes mellitus is a chronic disease with serious long-term debilitating complications and no known cure. The relationship between oral health and diabetes has been extensively studied. The factors associated with tooth loss, dental caries, loss of periodontal support, a history of dental care are additive over time, oral lesions were more associated with an older population of diabetes (*Levin et al, 1996 and Loe et al, 1965*). Our study shows that higher frequency of diabetic patients are found in a population and also noted high frequency bacterial isolates were screened in diabetic patients (7 species) as compared to non-diabetic patients (2 species). These results agree with *Mustard and Packham (1984) and Murray et al (2003)*.

In the present study, results of isolation revealed the presence of *Bacillus subtilis*, Gram positive bacilli non spore forming, *Streptococcus pyogenes* (Group A streptococcus), *Streptococcus sp* (Group B streptococcus) and *Enterococcus faecalis* were isolated from diabetic patients.

In non-diabetic patients, the commonest isolates were gram positive bacilli non spore forming and the gram negative *Pseudomonas aeruginosa*. It was clear that the oral bacterial infection was more common in diabetic patients and dental caries was more common in non-diabetic patients. A

comparative study of diabetic and non-diabetic patients showed that bacterial flora frequency was higher in diabetic patients as compared to non-diabetic patients as reported by *Oliver and Tervonen (1993)*. In addition, *Sharma et al (2011)* isolated *Streptococcus salivarius*, *Actinobacillus actinomycetemcomitans*, *Bacteroides oralis*, *Staphylococcus aureus* and *Streptococcus mutans* from diabetic patients as bacterial flora of oral infection. In non-diabetic patients, the commonest isolates were *Streptococcus mutans*, *Staphylococcus aureus*, *Serratia sp.*, and *Streptococcus lactis*. (*Lamster et al, 2008*) found that diabetes mellitus has been related to numerous oral complications, such as periodontal disease, decreased function of salivary glands (xerostomia), and burning mouth sensation. Another manifestation of diabetes and an oral sign of systemic immunosuppression was the presence of opportunistic infections, such as oral candidiasis (*Muzyka and Glick, 1995; Guggenheimer et al, 2000 and Samaranayake et al, 2009*). In poorly controlled glycaemic diabetics, polyuria reduces the salivary secretion with the subsequent clinical complaint of xerostomia by causing dehydration and loss of urinary electrolytes (*Klasser et al., 2008 and Motta-Silva et al, 2010*).

Chronic hyperglycemia has been closely associated with an

inflammatory response that has been linked to complications observed in diabetes. The presence of periodontal disease represents a unique opportunity for oral pathogens and their products to gain access to the systemic circulation. Bacterial toxins are known to elicit immune responses that can disrupt homeostasis of the system and in some instances can result in lethal outcomes to the individual.

Studies have provided evidence that control of periodontal infection has an impact on improvement of glycemic control evidenced by a decrease in demand for insulin and decreased hemoglobin A1c levels (*Danesh and Appleby, 1998; Desvarieux et al, 2005, Fiehn et al, 2005*). However, some studies did not find a significant relationship between glycaemic control and periodontal status (*Barnett et al, 1984 and Tervonen et al, 2000*). The degree in which glycaemic control takes influence and the multifactorial nature of periodontal disease seems to depend on the individual patient's variability (*Soell et al, 2007*).

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بكتريا الفم فى مرضى السكر وغير مرضى السكر

اصبح مرض السكر مشكلة صحية عالمية متزايدة مؤديا هذا المرض الى العديد من التعقيدات. لقد تم جمع وزراعة اثنين وعشرون عينة من لعاب المرضى من احدى العيادات العامة من مدينة الاسماعيلية وذلك وبطريقة معقمة. وظهرت بكتيريا الموجبة الجرام الغير مكونة للحافظة الجرثومية بنسبة ٢٧ بالمئة من مجموعتين الاولى متكونة من ١٦ مريض بالسكر (مقسمة الى ٣ مرضى سكر من النوع الاول و١٣ مريض بالسكر من النوع الاثنانى) والمجموعة الثانية مكونة من ٦ افراد غير مصابين بمرض السكر. و تم عزل انواع البكتريا المسماه ب باسيلس سابتليس واستربتوكوكس بايوجينس و استرتيتوكوكس اجالاكتيا و انتيروكوكس فاكيلس من مرضى السكر بنسبة ٣٦% و ١٣% و ٤% و ٤% بالترتيب. وظهرت بكتريا السودوموناس ارجينوزا بنسبة ٤ % فى الافراد الغير مصابين بالسكر .