

LETTER TO THE EDITOR

ORAL *CANDIDA* CARRIAGE AND SPECIES PREVALENCE IN DENTURE STOMATITIS PATIENTS WITH AND WITHOUT DIABETESF. JAVED¹, A.A. AL-KHERAIF², S.V. KELLESARIAN¹, F. VOHRA³ and G.E. ROMANOS^{4,5}

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The objective of this study was to assess the oral *Candida* carriage and species prevalence in denture stomatitis (DS) patients with and without diabetes mellitus (DM). To address the focused question “In patients receiving dentures, how does having diabetes compared to no diabetes influences the carriage and species prevalence of oral *Candida*?” indexed databases were explored without time or language restrictions up to and including February 2017. Nine studies were included. In these studies, the number of diabetics ranged between 14 patients and 405 individuals with mean ages ranging between 33 years and 66.4 years. In five studies, the percentage of hyperglycemic patients in the diabetic group ranged from 14.3% to 100%. In one study, all diabetic patients were normoglycemic. Seven studies reported *Candida*-associated DS to be significantly higher among diabetics than non-diabetics. *Candida albicans* was the most prevalent species isolated among diabetics and non-diabetics with DS. Denture-wearers with DM are more susceptible to *Candida*-associated DS as compared to non-diabetics.

To the Editor,

Candida (C) albicans is the most common fungal specie found in the oral cavity and forms an integral part of the normal human oral flora (1). However, *Candida* species can become opportunistic pathogens in immunocompromised patients, such as those with poorly-controlled diabetes mellitus (DM) and acquired immune deficiency syndrome (2, 3). Denture stomatitis (DS) is a chronic erythematous inflammatory condition that occurs on the oral mucosal surfaces beneath the denture surfaces of partially and completely edentulous individuals (4).

DS is frequently asymptomatic; however, patients may complain of halitosis, burning sensation and/or altered taste (5). The prevalence of DS among denture-wearers ranges between 15% and 70% (5). It has been reported that poor glycemic control and therapeutic dentures in patients with DM predispose them to oral mucosal disorders including oral candidiasis (1). Bianchi et al. (6) also reported that counts of oral yeast colonies are elevated on the denture surfaces of diabetic patients as compared to non-diabetic (ND) individuals. It is therefore hypothesized that oral *Candida* colonization and

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Table I. Characteristics of studies included.

Authors et al.	Study Groups	Age (mean years)	Gender F (%)	Type of Denture Stomatitis	Duration of denture wearing (years)	Glycemic status (%)	Smoking status (%)	Outcome
Chopde et al. (7)	100 DS 100 NDS	DS: 64.1 NDS: 65.8	DS: 50 NDS: 50	NA	NA	NA	NA	71.6% of diabetics had candida associated DS. Prevalence of DS was significantly higher in diabetics than non-diabetics.
Daniluk et al. (8)	32 diabetic 23 ND	DM: 66.4	55.8	Type I was more common among both diabetics and non-diabetics.	NA	NA	NA	Prevalence of DS was comparable among diabetics (71.4%) and non diabetics (75%)
Dorko et al. (9)	240 DS 350 NDS	NA	NA	NA	NA	Hyperglycemic**	NA	100% of diabetics had Candida-associated DS. Prevalence of DS was significantly higher in diabetics than non-diabetics.
Dorko et al. (10)	14 DSD 226 DSND	NA	55	NA	NA	NA	NA	100% diabetics had DS. Prevalence of DS was significantly higher in diabetics than non-diabetics.
Dorocka-Bobkowska et al. (11)	70 T2DM 58 ND	T2DM: 57 ND: 58	T2DM: 58.6 ND: 53.4	Type II was common among diabetics and type I among non-diabetics.	T2DM: 5.1 ND: 4.1	Hyperglycemic 14.3%	NA	Prevalence of DS was significantly higher in diabetics (87.8%) than non-diabetics (52.4%).
Dorocka-Bobkowska et al. (12)	110 T2DM 50 ND	T2DM: 63.2 ND: 66.9	T2DM: 57.3 ND: 42	Type-II was more common in diabetics than ND patients (57.3% vs 30%)	T2DM: 5.3 ND: 6.2	Hyperglycemic 56%	NA	Prevalence of DS was significantly higher in diabetics than non-diabetics.
Guggenheimer et al. (13)	405 T1DM 268 ND	T1DM: 33 ND: 31.8	T1DM: 49.6 ND: 59.7	NA	NA	Hyperglycemic	19.4% diabetics	Candida-associated DS was greater in diabetics than control group (15.1% vs 3% respectively).
Sanita et al. (14)	40 DSD 80 DSND 90 ND without DS	DSD: 62.4 DSND: 59.6 ND-NDS: 65.5	DSD: 87.5 DSND: 77.5 ND-NDS: 72.3	Mostly Type-II in all groups	DSD 13.7 DSND 15.1 ND-NDS 4.5	Normoglycemic†	12.5 15 13.3	Prevalence of DS was comparable among diabetics and non-diabetics
Vitkov et al. (15)	52 DSD 40 DSND 40 ND without DS	DSD: 65 DSND: 36 ND without DS: 59	DSD and DSND: NA ND without DS: 50	Type II was more common type among diabetics.	NA	Hyperglycemic 90%	NA	Prevalence of DS was significantly higher in diabetics (35%) than non-diabetics.

DS: Denture stomatitis; NDS: Without denture stomatitis; ND: Non-diabetic; T1DM: Type 1 diabetes mellitus; T2DM: Type 2 diabetes mellitus; DSD: Denture stomatitis with diabetes; DSND: Denture stomatitis without diabetes; NA: Not available

* Hemoglobin A1C > 8% and/or fasting blood glucose levels greater than 130 mg/dL

† Hemoglobin A1C < 7% and/or fasting blood glucose levels between 90-130 mg/dL

species prevalence varies among DS patients with and without DM. The aim of this study was to assess oral *Candida* carriage and species prevalence in DS patients with and without diabetes through a review of the literature.

MATERIALS AND METHODS

The addressed question was “In patients receiving dentures, how does having diabetes compared to no diabetes influence the carriage and species prevalence of oral *Candida*?” an electronic search without time or

language restrictions was conducted up to and including February 2017 in MEDLINE/PubMed, EMBASE, Scopus, ISI Web of knowledge, and Google-Scholar databases using the following medical subject headings (MeSH): “*Candida*”, “*Candida albicans*”, “*Candida tropicalis*”, “*Candida glabrata*”, “candidiasis”, “denture stomatitis”, “diabetes mellitus”, “colonization” and “prevalence”.

RESULTS

In total, 9 studies (7-15) were included and

processed for data extraction. In 7 studies (7, 9-13, 15) *Candida*-associated DS was significantly higher in diabetics as compared to ND individuals. Only one study (8) reported *Candida*-associated DS to be higher among the NDs in comparison to diabetics (75% vs 71.4%, respectively). *C. albicans* was the most common species isolated from the palatal and denture surfaces of denture-wearers with and without diabetes. Percentages of *C. albicans* carriage among diabetic and ND denture-wearers ranged between 51.6% - 100% and 64% - 93% respectively. In the study by Sanita et al. (14), *C. albicans* was isolated from 93% ND patients with DS. *C. tropicalis* and *C. glabrata* were reported as the second most prevalent oral yeast species (9, 11, 12, 14). Comparable percentages of *C. tropicalis* and *C. glabrata* were found in both diabetic and ND denture-wearers. Three studies (9, 11, 12) also reported other oral *Candida* species, such as *C. dublinensis*, *C. famata*, *C. gullerimondi*, *C. krusei* and *C. parapsilosis*, in denture-wearers with and without DM (Table I).

DISCUSSION

We reviewed indexed literature to assess *Candida*-associated DS in patients with and without DM. Results from nearly 78% studies (7, 9, 10, 12, 13, 15) showed that candida-associated DS was more commonly manifested in diabetic as compared to ND individuals. Most of the studies evaluated did not report the severity of DS; and none of the studies evaluated reported the SFR among the study groups. In this regard, it remains unclear whether or not the severity of DS and SFR have any association with oral *Candida* carriage among patients with and without DM. Furthermore, the duration of denture wearing has also been associated to a higher prevalence of DS. From the literature reviewed, the duration of denture wearing among diabetic and ND patients with DS ranged between 4 and 15 years. It is demanding to estimate a minimum duration of denture-wearing that might expose partially and/or completely edentulous individuals to DS. Hence, further studies with standardized parameters such as type of DS, denture-wearing age

and salivary flow rate of the included participants are warranted. It is emphasized that dentists and physicians should be aware of the fact that DM can influence the oral *Candida* carriage among patients with dentures. Therefore, diabetic patients should undergo periodical comprehensive oral evaluation, including reinforcement of oral/denture hygiene techniques, and denture evaluation, adjustment or replacement.

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