Oral *Candida* colonization in Thai denture wearing elderly with hyposalivation

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ปริมาณเชื้อราแคนดิดาในผู้สูงอายุชาวไทยใส่ฟันเทียมที่มีภาวะน้ำลายน้อย

น.ส.นฎา บูรณารมย์

วิทยานิพนธ์นี้เป็นส่วนหนึ่งของการศึกษาตามหลักสูตรปริญญาวิทยาศาสตรมหาบัณฑิต
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นฎา บูรณารมย์ : ปริมาณเชื้อราแคนดิดาในผู้สูงอายุชาวไทยใส่ฟันเทียมที่มีภาวะน้ำลายน้อย. (Oral *Candida* colonization in Thai denture wearing elderly with hyposalivation) อ.ที่ปรึกษาหลัก : ผศ. ทญ. ดร.อรพินท์ โคมิน, อ.ที่ปรึกษาร่วม : รศ. ทญ. ดร.อรนาฎ มาตังคสมบัติ

การศึกษาแบบตัดขวางนี้ มีวัตถุประสงค์ของการศึกษาเพื่อศึกษาความสัมพันธ์ระหว่างภาวะน้ำลายน้อย การมีเชื้อแคนดิดาในช่องปาก และสุขภาพช่องปากในผู้สูงอายุ และเพื่อต้องการศึกษาปัจจัยที่มีผลต่ออัตราการหลั่งน้ำลายและการมีเชื้อแคนดิดาในช่องปาก

วิธีดำเนินการวิจัย โดยจากกลุ่มตัวอย่างผู้สูงอายุทั้งหมด53คน ถูกสัมภาษณ์เกี่ยวกับโรคประจำตัว การใช้ยาที่มีผลต่ออาการปากแห้ง อาการปากแห้ง การทำความสะอาดช่องปากและ ข้อมูลการใช้ฟันเทียม ส่วนตัวอย่างน้ำลายขณะพักและเมื่อถูกกระตุ้น ลักษณะในช่องปากที่เกี่ยวข้องกับอาการปากแห้ง ดัชนีโรคเหงือกอักเสบ ดัชนีคราบที่ลิ้น และดัชนีรากฟันผุ เก็บข้อมูลจากการตรวจในช่องปาก ตัวอย่างน้ำลายเมื่อถูกกระตุ้นถูกนำไปตรวจหาปริมาณ และชนิดของเชื้อราแคนดิดา

ผลการศึกษา พบว่า ภาวะน้ำลายน้อยมีความสัมพันธ์กับการมีเชื้อแคนดิดาในช่องปาก(p=0.010; adjusted OR=4.360, 95% confidence interval=1.292-14.717) ดัชนีโรคเหงือกอักเสบ และ ดัชนีคราบที่ลิ้น (p=0.003 and 0.015 ตามลำดับ) แต่พบว่าดัชนีรากฟันผุไม่สัมพันธ์กับการมีเชื้อแคนดิดาในช่องปาก นอกจากนั้นยังพบว่า ดัชนีโรคเหงือกอักเสบ ดัชนีคราบที่ลิ้น และการมีเชื้อแคนดิดาในช่องปาก นั้นมีความสัมพันธ์เชิงลบกับ อัตราการหลั่งน้ำลายทั้งขณะพักและเมื่อถูกกระตุ้น และเมื่อพิจารณาการใส่เทียมพบว่ากลุ่มที่ใส่ฟันเทียมสัมพันธ์กับการมีเชื้อรากลุ่มไม่ใช่แคนดิดา อัลบิแคนส์ในช่องปาก

โดยสรุปพบว่า ภาวะการน้ำลายน้อยเป็นปัจจัยเสี่ยงต่อการมีเชื้อราแคนดิดาในช่องปากและสุขภาพช่องปากที่ไม่ดีในผู้สูงอายุ เนื่องจาก ภาวะน้ำลายน้อยอาจส่งผลกระทบต่อสุขภาพช่องปากและสุขภาพร่างกายโดยรวมในผู้สูงอายุ ดังนั้นการเฝ้าระวังและติดตามภาวะน้ำลายน้อยในผู้สูงอายุจึงเป็นสิ่งสำคัญ

สาขาวิชา	ทันตกรรมผู้สูงอายุและการดูแลผู้ป่วยพิเศษ	ลายมือชื่อนิสิต .....
ปีการศึกษา	2562	ลายมือชื่อ อ.ที่ปรึกษาหลัก .....
		ลายมือชื่อ อ.ที่ปรึกษาร่วม .....

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KEYWORD: hyposalivation, Candida, elders, salivary flow rate, oral health

Nada Buranarom : Oral *Candida* colonization in Thai denture wearing elderly with hyposalivation. Advisor: Asst. Prof. ORAPIN KOMIN, D.D.S, Ph.D. Co-advisor: Assoc. Prof. ORANART MATANGKASOMBUT, D.D.S, Ph.D.

Objective: To examine relationships between hyposalivation, oral Candida colonization and oral health status in generally healthy elders and evaluate factors that affect salivary flow rates and Candida colonization in a cross-sectional study.

Materials and methods: Fifty-three elderly participants were enrolled and interviewed for medical history, subjective dry mouth symptoms, oral hygiene practice and denture information. Unstimulated and stimulated salivary flow rates, clinical signs of dry mouth, gingival index, tongue coating index and root caries index were recorded. Stimulated saliva samples were cultured on Sabouraud dextrose agar for colony counts and Candida species were identified with chromogenic Candida agar and polymerase chain reaction.

Results: Hyposalivation was associated with higher prevalence of oral Candida colonization (p=0.010; adjusted OR=4.360, 95% confidence interval=1.292-14.717), higher gingival and tongue coating indices (p=0.003 and 0.015, respectively), but not root caries index. These two indices and Candida load were also negatively correlated with unstimulated and stimulated salivary flow rates. Non-albicans Candida species were more frequently isolated in patients who wore dentures (p=0.017).

Conclusion: Hyposalivation is a risk factor for oral Candida colonization and poorer oral health in generally healthy elderly participants. Because hyposalivation could adversely affect oral and systemic health, we suggest that it be carefully monitored in elders.

Field of Study:	Geriatric Dentistry and Special Patients Care	Student's Signature .....
Academic Year:	2019	Advisor's Signature .....
		Co-advisor's Signature .....

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CHAPTER I

INTRODUCTION

BACKGROUND AND RATIONALE

As global life expectancy increases, the world's ageing population is continually growing[1]. For example, in Thailand, the elderly population is estimated to be more than 20 million by 2035[2]. However, the longer life expectancy may not translate into extended health lifespan and there are increasing oral and systemic health problems in the elderly population. Furthermore, the increased incidence of systemic diseases and several drugs used in elderly can lead to poorer oral health condition such as xerostomia, periodontal disease, tooth decay, tooth loss, oral candidiasis, precancerous and cancerous oral lesion[3-5].

Xerostomia as defined as the individual expression of mouth dryness which may occurred with or without decrease saliva flow[6]. Whereas hyposalivation signified decrease salivary secretion[7]. The overall estimated prevalence of dry mouth (xerostomia or hyposalivation) was 22.0% and the prevalence was higher in the elderly[8, 9]. The common etiology of dry mouth (xerostomia) and hyposalivation are salivary gland diseases, head and neck radiation therapy, autoimmune disease, HIV , graph vs host disease, physiological causes and side effects of medications[10, 11].

The primary functions of saliva include cleansing and lubricating of oral soft and hard tissues, preparation of food for initial digestion, bolus formation for swallowing, modulation of taste perception, facilitation of mastication and phonation, maintenance of oral pH within 6.8-7.2, protecting against acidic challenges from cariogenic bacteria, and promoting remineralization of early carious lesions[12]. Moreover, it maintains the equilibrium of oral microbial ecosystem by its immune components [13, 14]. Saliva contains histatins, defensins, LL-37 and lysozymes, which have antibacterial and antifungal activities [15, 16]. Salivary dysfunction in elders should not be considered normal but should be evaluated carefully.

Reduced salivary flow result in changes of oral microorganism[15], impaired lubrication, buffering capacity, oral clearance, taste and digestion[17]. This alteration finally increases oral disease such as gingival inflammation, tooth decay and mycotic Reduced salivary flow result in changes of oral microorganism[15], impaired lubrication,

buffering capacity, oral clearance, taste and digestion[17]. This alteration finally increases oral disease such as gingival inflammation, tooth decay and mycotic infection[13, 18]. *Candida* is an oral commensal microorganism. However, when the immune status of the host is reduced or there are local predisposing conditions, these fungi can cause oral and systemic infection (candidiasis)[19]. When the salivary flow is reduced, *Candida* accumulation is increased, which could elevate the risk of oral candidiasis[15]

Other local factors that predispose to oral candidiasis are poor oral hygiene, improper-fitting dentures, inadequate denture cleansing, or long-term denture usage[20]. These conditions are prevalent in the elders and may contribute to risk of *Candida* infection. Furthermore, denture use was associated with higher colonization of non-albicans *Candida species* (NACS) in xerostomic post-radiation therapy patients[21]. The NACS, such as *Candida tropicalis*, *Candida glabrata*, *Candida dubliniensis*, *Candida krusei*, and *Candida parapsilosis*, can cause infections that are more resistant to antifungal drugs. These species were commonly found in patients with underlying systemic conditions, such as head and neck cancer, and HIV infection[22-24]. As the commensal oral *Candida* may become a source of infection when the host becomes immunocompromised [25], therefore the information regarding oral carriage of *Candida* and factors that affect colonization are important to evaluate for the risk of infection in the elderly population.

This study aimed to examine the association between oral *Candida species* colonization and hyposalivation in Thai elders. We also evaluated the factors that associate with affect salivary flow rate, *Candida* colonization, and oral health status as measured by gingival, tongue coating, and root caries indices.

RESEARCH QUESTIONS

Does oral *Candida* colonization in elderly with normal saliva flow rate differ from those with hyposalivation?

Does oral health status in elderly with normal saliva flow rate differ from those with hyposalivation?

RESEARCH OBJECTIVES

To evaluate association between *Candida* colonization and hyposalivation in Thai elderly.

To evaluate association between oral health status and hyposalivation in Thai elderly.

RESEARCH HYPOTHESIS

Null hypothesis(H0)

There is no statistically significant difference in *Candida* colonization in elderly with normal saliva flow rate versus those with hyposalivation.

Alternative hypothesis(H1)

There is statistically significant difference in *Candida* colonization in elderly with normal saliva flow rate versus those with hyposalivation.

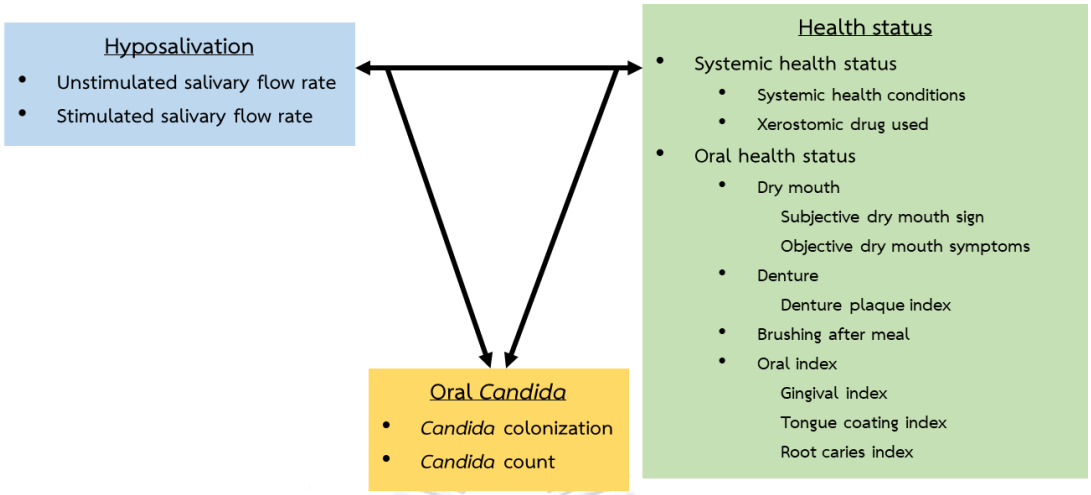
Null hypothesis(H0)

There is no statistically significant difference in oral health status in elderly with normal saliva flow rate versus those with hyposalivation.

Alternative hypothesis(H1)

There is statistically significant difference in oral health status in elderly with normal saliva flow rate versus those with hyposalivation.

CONCEPTUAL FRAMEWORK



EXPECTED BENEFITS

The results of this study will provide information about the level of *Candida* colonization in the oral cavity and factors that affect salivary flow rate of Thai elderly. This information will be useful for surveillance of people at risk of xerostomia or hyposalivation and their consequences in order to provide early detection, prevention and appropriate treatment. Hence, optimal oral health will be maintained.

CHAPTER II

REVIEW OF RELATED LITERATURES

ORAL HEALTH STATUS IN THE ELDERLY

As a consequence of decreased mortality and reduced fertility, the global life expectancy is increasing, and is expected to reach 75 years in 2045 – 2050, which results in a considerable increment of ageing population all over the world [(1)]. The number of Thai elderly has increased from approximately 1.5 million in 1960 to 10.7 million in 2015 or 16% of the total population. It is expected to reach to more than 20 million by 2035[(2)]. As Thai population life span is longer, healthy life expectancy of ageing people is decreasing which reflects the increased elderly health status problems. According to Thailand Health Research Institute and National Survey of The Welfare of The Elderly in Thailand, common important health problems among Thai elderly are hypertension, diabetes mellitus, osteoarthritis, heart diseases and major stroke[(2)].

FDI has defined the definition of oral health as "Oral health is multifaceted and includes the ability to speak, smile, smell, taste, touch, chew, swallow, and convey a range of emotions through facial expressions with confidence and without pain, discomfort, and disease of the craniofacial complex"[(26)]. Oral health is an essential part of general health and an important component of QOL. Poor oral health which can be related to systemic diseases in a two-way relationship becomes more apparent in old age. The risk of developing oral diseases increase with age. Poor oral health conditions including xerostomic conditions, tooth loss, periodontal and dental diseases, poor oral and dental hygiene, caries, oral cancer and precancer lesions can be seen more frequent in the elderly[(3, 5, 27)]. Poor oral health in the elderly may affect daily life quality in many aspects. Extensive tooth loss and edentulous condition will reduce chewing performance which lead to changes from fiber rich diet to carbohydrate rich as well as diet rich in fats and cholesterols[(28)]. Edentate person with difficulty in chewing and swallowing may avoid certain food resulting in adequate daily intake of nutrition , subsequence weight loss[(29)] , social communication handicap[(30)].

Furthermore systemic diseases such as diabetes mellitus[31]cardiovascular disease[32] and COPD[33] are common risk factor for poor general health and oral health.

PHYSIOLOGY OF SALIVARY GLAND

Saliva is an essential body fluid of critical importance in maintenance oral health. This complex fluid comes from 3 pairs of major salivary glands (parotid, sublingual, and submandibular glands) and numerous minor salivary glands (buccal, labial, palatal) incorporating a wide variety of composition and physicochemical properties, controlled by the sympathetic and parasympathetic autonomic nervous system[34]. The secretion is controlled by a reflex arch consisting of afferent receptors and nerves stimulated by the action of gustation, mastication, or smell, transmitting the impulse to the salivary nuclei (salivation center) in the medulla oblongata. The efferent impulse innervated the salivary glands through the sympathetic and parasympathetic nerve bundles completing the secretory reflex arch by using acetylcholine as neurotransmitter[10]. Stimulation of parasympathetic nerve initiate the secretion of water and electrolytes, whereas stimulation of sympathetic nerve commenced the secretion of proteins amylase secreted by the parotid gland, lipase secreted by the lingual von Ebner's gland, lysozyme, peroxidase, proline-rich proteins[35] and mucins from submandibular and sublingual[35]. Reabsorption of sodium and chloride ions in primary saliva (isotonic plasma-like fluid) though the duct system is converted into the hypotonic saliva[10].

Whole saliva is a mixture of not only saliva secretion but also fluids, debris and cells not originating from salivary glands. The main advantage of whole saliva specimen collection is that it is easy and noninvasive. The unstimulated secretion is significantly influenced by time of collection and body position. For reliable monitoring of the functional potency of a salivary gland, it is recommended to collect both unstimulated and stimulated saliva during an appropriate period.

FUNCTIONS AND COMPOSITIONS OF SALIVA

Saliva is secreted from the parotid, submandibular and sublingual glands accounting for about 90% of the fluid production as well as from the minor salivary glands, gingival crevicular fluid in the oral mucosa. the daily production of saliva normally ranges from 0.5 to 1.5 lite[36, 37]. Saliva is composed of water 99% and 1% of

protein and electrolytes[27]. Under stimulated condition the parotid glands secrete 50% of thin, serous, amylase-rich watery and fluid. Whereas unstimulated saliva is secreted mainly from the submandibular glands consisting both serous and viscous mucin-rich saliva. The sublingual glands consist of mucous acinar cells and secrete 1–2% of the unstimulated, viscous mucin-rich whole saliva[27]. Saliva is crucial for the maintenance of the health of oral tissues[27]. In general, saliva has three main functions; it protects the mineralized tissues against wear, inhibits demineralization and promotes remineralization, prevents oral infection and promotes the digestion of food[27]. In addition, a thin salivary film coats the surfaces of the soft and hard tissues of the mouth. This film keeps the tissues moist. The saliva's ability to defend the oral tissues and prevent infection is served by a large number of anti-fungal, antibacterial, and antiviral systems as well as by a large number of protective proteins such as immunoglobulins A, mucins, protein-rich glycoproteins, lysozymes, lactoferrin and agglutinin. These antimicrobial components in saliva have broad spectral antimicrobial activity[38]. And finally, saliva plays a part in moistening and lubricating the oral cavity, and plays crucial role in our daily food consumption, both in tasting food and in preparing a bolus of food suitable for the swallowing process[27].

XEROSTOMIA AND HYPOSALIVATION IN ELDERLY

Xerostomia is the subjective complaint of dry mouth[39]. Hyposalivation is the objective evidence of salivary gland hypofunction[40]. The two conditions are interrelated and share common etiology[6]. The reported prevalence of xerostomia in the literature varies from 10%-80%[41-49], yet it is probable that approximately 30% of the population aged over 65 year experience these disorders[50]. The common etiology of xerostomia and hyposalivation are disease of salivary gland, radiation treatment for head and neck cancer, various connective tissue disorders or side effect of medication The common etiology of dry mouth (xerostomia) and hyposalivation are salivary gland diseases, head and neck radiation therapy, autoimmune disease, HIV , graph vs host disease, physiological causes and side effects of medications[10, 11]. Medications are the most common cause of hyposalivation in the elderly[51]. More than 400 medications have been reported to cause hyposalivation[52]. It is known that the following groups of drugs cause dry mouth: antihypertensives, anticholinergics, antihistamines,

benzodiazepines, cytostatics, diuretics, proton pump inhibitors and H2 antagonists, antipsychotics, antidepressants, hypnotics, opioids, muscarinic antagonists and alpha receptor agonists, appetite suppressors, bronchodilators, drugs for HIV treatment, retinoids, medications for migraine treatment, decongestants, and skeletal muscle relaxants[53, 54]. Interestingly, xerostomia can be perceived in the presence of normal salivary flow rate[55, 56], or changes in the salivary composition[56, 57]. Whereas individuals with reduced salivary flow rate may not complain about xerostomia[11].

The diagnosis of xerostomia and hyposalivation requires a medical history, subjective symptoms and objective signs. Subjective symptoms are typically described as complain of dry mouth, difficult swallowing or speaking, poor tolerance of spicy, acidic, and crunchy food or difficulty in retaining the dentures[58]. Self-reported xerostomia poorly correlated with hyposalivation. Whereas clinical evidence of oral dryness showed significant correlation with hyposalivation[59]. Several types of questionnaire have been designed to increase reliability of screening test for hyposalivation[7, 14, 56, 60]. However, the evidence of clinical oral dryness and subjective oral dryness were not enough to signified hyposalivation. Hence the individual unstimulated flow rate should also be determined[59].

Moreover oral examination of clinical signs includes sticking of an intraoral mirror to the buccal mucosa or tongue, frothy saliva, no saliva pooling in floor of mouth, loss of papillae of the tongue dorsum, altered/smooth gingival architecture, glassy appearance to the oral mucosa, lobulated/deeply fissured tongue, cervical caries and mucosal debris on palate (except under dentures) are pathognomonic clinical signs for hyposalivation[14].

Measuring salivary flow rate is the most advocated method to determine salivary gland hypofunction[61]. The unstimulated whole Salivary flow rate less than 0.1 ml./min. and stimulated whole salivary flow rate less than 0.7 ml./min. is considered hyposalivation[37, 41, 49, 55, 62-64]. The correlation between whole salivary flow rate and xerostomic complaint are not strong[49].

Although salivary function was thought by some to decline with age, it is now accepted that the production of saliva and its composition are largely age-independent in healthy people[65].

CONSEQUENCE OF XEROSTOMIA AND SALIVARY GLAND HYPOFUNCTION

Hyposalivation, a decrease in salivary flow, is common in older people. Salivary secretion and composition in healthy individual are mainly aged independent[65-68]. Principal primary functions of saliva include cleansing and lubricating of oral soft and hard tissues, preparation of food for initial digestion and bolus formation for swallowing, modulation of taste perception, facilitation of mastication, phonation, retention of removable prostheses, maintaining oral pH within 6.8–7.2 and protecting against acidic challenges from bacterial cariogenic pathogens, promoting remineralization of early carious lesions[69-71]. It maintains the equilibrium of ecosystems of oral microbiota by its antibacterial, antiviral, and antifungal capacities[12, 14, 72, 73]. Saliva dilutes and facilitates oral clearances of food particles and microorganism from oral cavity through process of swallowing there for it promotes the microbiomes balances[74, 75]. Shifting in microorganism balance favors outgrowth of cariogenic bacteria which can produce acidic environment, thereby increasing the risk of caries[16, 76, 77]. Inorganic component such as bicarbonate and phosphate help maintaining a constant pH of saliva. Moreover calcium and phosphate play an important role in maintaining saturation of hydroxyapatite and integrity of tooth surface[78]. Patient with hyposalivation tend to consume carbohydrate and hence favor the grow of cariogenic bacteria and *Candida spp.*[79, 80] [81]. The cervical regions, occlusal and incisal surfaces of teeth receiving repeated abrasion from tooth brushes and exposure to attritional and traumatic forces are susceptible to dental erosion[82], Increasing exposure of cemental surfaces occurred in remaining teeth predisposes the elderly over 65 years developing root surface caries more than younger age [18]. Additionally, Patients with chronic hyposalivation are susceptible to gingivitis and periodontal problems[82]. Proper brushing and cleaning of teeth and tongue are essential measure to reduced microorganism load and to promote oral health[83].

Salivary dysfunction can predispose to oral candidiasis[84]. It dilutes and removes microorganism from oral mucosal surface[84]. A variety of antimicrobial substances such as lysozyme, mucins, lactoferrin, proline-rich protein, statherin, cystatins, histatins and immunoglobulin act directly or indirectly in maintaining balanced microbiome environment[85]. *Candida spp.* colonization and candidiasis in

the elderly are common but often overlooked, particularly in denture wearer[86]. Carriage rates in general population have been reported between 20%-75%[87], 30%-50% in healthy people[88], 50%-65% in denture wearer[88]and 65%-80% in health care residences[89, 90]. The predisposing factors for denture stomatitis are oral hygiene, denture base, denture usage and systemic factors. Moreover, the present of porosity and rough surfaces of the denture base make the cleaning of the denture more difficult [91]. Furthermore wearing denture overnight prevent the mucosa from saliva clearance therefore removal the denture at night will promote the underlying mucosa to obtain optimal oral environment[91]. In addition a number of systemic diseases a number of systemic diseases (endocrine disturbances, nutritional deficiencies, malignant diseases (leukemia), agranulocytosis and treatments with various drugs may also increase the susceptibility to oral candidiasis[92].

CHAPTER III

RESEAECH AND METHODOLOGY

POPULATION AND SAMPLE

Study participants were recruited from 120 elderly dental patients in the waiting list of graduate geriatric clinic at the faculty of dentistry, Chulalongkorn University, and 240 members of Phaholpolpayuhasena hospital elderly club. Inclusion criteria include patients aged 65 years and over who had at least 4 pairs of posterior occlusal contact, were in good general health (ASA class I or II), were willing to participate and able to provide saliva samples. Exclusion criteria include those who had used systemic antibiotics or antifungal drugs within the last 6 months, used topical antibiotics, topical antifungal or topical steroid in the oral cavity within the previous 7 days, had acute illness, had poorly controlled systemic disease, or any evidence of having the following conditions: precancerous or cancerous oral lesions, periodontal pockets deeper than 4 mm (mild gingivitis is acceptable), infections related to carious teeth (apical abscess, space infections), or oral candidiasis.

A total of 53 participants gave written informed consents and were enrolled in the study. The study protocol was approved by the research ethics committee of the Faculty of Dentistry, Chulalongkorn University (HREC-DCU 2017-094, Approval date: 2nd March,2018) and Phaholpolpayuhasena hospital (IRB number 2018-01, Approval date: 16th January 2018) in accordance with the Declaration of Helsinki.

SAMPLE SIZE

Thai elderly dental patients in graduate prosthodontic and geriatric clinics at the faculty of dentistry, Chulalongkorn university and Paholpolpayuhasena Hospital elderly club who follow inclusion and exclusion criteria is selected to join this study.

SAMPLE SIZE CALCULATION

$$n_1 = \frac{(z_{1-\frac{\alpha}{2}} + z_{1-\beta})^2 \left[\sigma_1^2 + \frac{\sigma_2^2}{r}\right]}{\Delta^2}$$

$$r = \frac{n_2}{n_1}, \Delta = \mu_1 - \mu_2$$

Sample size is calculated by using the following formula with the mean and standard deviation of logCFU derived from a previous study[93] , **α** of 0.05, and power of study at 90%.

r = 1

μ_1 (mean of logCFU in subject with hyposalivary flow rate) = 3.11

μ_2 (mean of logCFU in subject with normal salivary flow rate) = 1.4

σ_1 (standard deviation of logCFU in subject with hyposalivary flow rate) = 1.647

σ_2 (standard deviation of logCFU in subject with normal salivary flow rate/hyposalivation) = 1.703

n (sample size) = 21

DATA COLLECTION

Participants were interviewed for demographic data including age, gender, underlying medical diseases, xerostomia-inducing drug used[53, 54], oral hygiene practice, denture information, subjective dry mouth symptoms[58]. More information concerning medical was also reviewed and collected from medical records.

Subjective dry mouth symptoms[58]were obtained by interviewing the subjects according to validated questionnaire[14] Eight questions consist of: 1. “Does your mouth feel dry at night or on awakening?” 2. “Does your mouth feel dry at other times of the day?” 3. “Do you keep a glass of water by your bed? 4. Do you sip liquids to aid in swallowing dry foods?” 5. “Does your mouth feel dry when eating a meal?” 6. “Do you chew gum daily to relieve oral dryness?”7. “Do you use hard candies or mints daily to relieve oral dryness?” 8. “Does the amount of saliva in your mouth seem to be too little?”. Participants who gave at least 1 positive response to these questions would be considered as subject with dry mouth symptom. Participants who gave at

least 1 positive response to these questions would be considered as subject with dry mouth symptom.

Oral examination, Information regarding objective dry mouth signs[14], gingival index(GI)[94], tongue coating index(TCI)[95], root caries index(RCI)[18]were determined upon oral examination by a trained dentist.

Objective dry mouth sign were examined[96]. The signs of dry mouth include sticking of an intraoral mirror to the buccal mucosa or tongue, frothy saliva, no saliva pooling in floor of mouth, loss of papillae of the tongue dorsum, altered/smooth gingival architecture, glassy appearance of the oral mucosa, lobulated/deeply fissured tongue. Participants with at least 1 sign would be considered as subject with dry mouth signs.

Gingival index was scored as previously described[94].The bleeding is assessed by probing gently along the wall of soft tissue of the gingival sulcus with a periodontal probe at four sites (mesial, distal, buccal and lingual surfaces) of six selected teeth (right maxillary first molar, right maxillary lateral incisor, left maxillary first molar, left mandibular first molar, left mandibular lateral incisor and right mandibular first molar). The scores were from 0=no inflammation 1= mild inflammation (slight change in color, slight edema, no bleeding on probing) 2 = moderate inflammation (moderate glazing, redness, edema and hypertrophy, bleeding on probing), and 3= severe inflammation (severe inflammation, marked redness and hypertrophy, ulceration, tendency to spontaneous bleeding). Gingival index score was calculated from total sum scores of 4 areas divided by four. Gingival index score for individual was calculated from total indies scores of teeth divided by six.

Gingival bleeding index (GI)

= (total score ÷ 24)

0 = absence of gingival inflammation

1 = mild inflammation: slight change in color, slight edema, no bleeding on probing

2 = moderate inflammation: redness, edema, glazing, bleeding on probing

3 = severe inflammation: marked redness and edema, ulceration, tendency toward

Tongue coating index[95] was scored and calculated as described. The tongue surface was divided into nine sections, tongue coating status was visually scored in each section. The total score was done in each area (0-2) by visualization as follows 0=coating not visible, 1=thin coating, 2=thick coating. Tongue coating index was calculated from sum of nine visual scores divided by eighteen. Percentage of tongue coating index was calculated from the following formula[95].

Tongue coating index (TCI)

= (total score ÷ 18) × 100

0 = Tongue coating not visible

1 = Tongue coating thin, papillae of tongue visible

2 = Tongue coating very thick, papillae of tongue not visible

Root caries index[18] was scored and calculated as described. All teeth with gingival recession was examined on four surfaces (mesial, distal, buccal and lingual). Total surface score of caries, filling and sound was count. Root surface caries was identified through a clinical examination[97] (lesion should be located at the cementoenamel junction or completely on the root surface, lesion should be a discrete, well-defined, softened area indicating decay and the explorer should enter easily and display some resistance to withdrawal). Filling lesions are counted when lesion at the cementoenamel junction. Crowned teeth were not included because the type of lesion that existed prior to the placement of the restoration could not be

determined. Percentage of root caries index was calculated from the following formula[18].

Root caries index (%)

=((R-D)+(R-F) ÷ (R-D)+(R-F)+(R-S)) × 100

R-D = number of root surface with decay in recession tooth

R-F = number of root surface with permanent filling in recession tooth

R-S = number of sound root surface in recession tooth

Denture plaque index[98] was scored as described. The dentures were rinsed through running tap water, and then painted with a plaque disclosant erythrosin dye. Excess dye was gently rinsed off after 30 seconds. Plaque and stain accumulations on

Denture plaque index (DPI)

= (total score ÷ 32) × 100

0 = No plaque

1 = Light plaque; 1% to 25% of area covered

2 = Moderate plaque; 26% to 50% of area covered

3 = Heavy plaque; 51% to 75% of area covered

4 = Very heavy plaque; 76% to 100% of area covered

the dentures were divided into eight groups, four on the tissue surface, and four on the polishing surface. The scoring was done in each area (0-4) by visualization as follows 0=No plaque, 1=Light plaque; 1% to 25% of area covered, 2=Moderate plaque; 26% to 50% of area covered, 3=Heavy plaque; 51% to 75% of area covered, 4=Very heavy plaque; 76% to 100% of area covered. Denture plaque index of denture was calculated from sum of eight visual scores divided by thirty-two. In case of participant with upper and lower dentures, the average of both upper and lower denture plaque index was representing the individual total score. Percentage of denture plaque index was calculated from the following formula[98].

Saliva collection

Participants were instructed not to use any mouth rinse for 12 hours and to withhold oral intake (food, medication, water), tooth brushing for 90 minutes prior to saliva collection. Saliva specimens were collected between 9:00-11:00 a.m. to

minimize variations associated with the circadian cycle. Before the saliva collection, subjects were instructed to swallow to clear the mouth from any accumulated saliva. During the saliva collection, participants sat straight with head slightly tilted forward and abstained from speaking and swallowing. Unstimulated whole saliva was collected by spitting the oral fluid available in the mouth into a graduated sterile tube every 30 seconds for 10 minutes. After 2 minutes break, stimulated whole saliva was collected by chewing a piece of paraffin wax (5x5 cm.) for a period of 2 minutes, then subjects spat and discarded the saliva available in the mouth. Subject then continued chewing through the process and spat saliva into a graduated sterile tube every 30 seconds for 5 minutes. The volume of clear saliva was measured to estimate salivary flow rate. Unstimulated salivary flow rate of less than 0.1 mL per minute or stimulated salivary flow rate of less than 0.7 mL per minute were considered hyposalivation[99, 100].

Candida counts and *species*

Saliva samples were immediately placed on ice and transferred to the laboratory for culture within 2 hours. Each sample was serially diluted to obtain 1:10, 1:100 and 1:1000 dilutions. A volume of 100µL of each dilution was spread on Sabouraud's dextrose agar plate containing streptomycin 5 mg/ml and penicillin G sodium 2500 unit/ml and incubated at 37°C for 48 hours. *Candida spp*. Colonies in Sabouraud's dextrose agar were characterized by white to cream colored. The number of Colony Forming Unit (CFU) per milliliter of saliva was calculated and transformed to logCFU/ml. for further analyses. Plates without fungal growth at 48 hours were further incubated for 2 weeks before being considered as negative.

Ten isolated yeast colonies on Sabouraud's dextrose agar were chosen and streaked on chromogenic *Candida* agar (oxoid, UK). *Candida* colonies were initially characterized based on colony color according to the manufacturer's recommendation (*C. albicans: green C. dubliniensis: green, C. tropicalis: metallic blues, C. krusei: pink, fuzzy, C. glabrata: white to mauve, C. parapsilosis*: white to mauve). Further species identification were accomplished using Polymerase chain reaction (PCR) using species-specific primers[24, 101] : *C. albicans* (CAL5-NL4CAL, CALB1F-CALB2R), *C. dubliniensis* (CDU2-NL4CAL,DUBF-DUBR), *C. glabrata* (CGL1-NL4CGL1) , *C. parapsilosis* (CP4-NL4LEL1), *C. tropicalis* (CTR22-NLN4CTR).

STATISTICAL ANALYSIS

Demographic data and prevalence of *Candida species* were evaluated by using descriptive statistics. Factors affecting salivary flow rate and *Candida species* colonization were analyzed using Pearson Chi-square test or Fisher's exact test for categorial data, and T-test or Mann-Whitney U test for continuous data. Logistic regression was used to calculate odds ratio adjusted for the effect of age. Correlations among factors were evaluated by Spearman correlation coefficient analysis. All analysis was performed with IBM SPSS statistics version 22. A p-value of less than 0.05 was considered statistically significant.

CHAPTER IV

RESULTS

Characteristics of study population

The characteristics of the participants are shown in Table 1. The average age of the study population was 71.9±6 years, age range was 65-92 years. Mean unstimulated and stimulated whole salivary flow rates were 0.35±0.26 ml/minute, USFR range 0.05-1.20 ml/min. and 0.97±0.60 ml/minute, SFR range 0.10-3.00 ml/min, respectively. Among the 53 participants, 22 (41.5%) had hyposalivation. The majority of the subjects were female (84.9%). Thirty-four subjects (64.2%) had underlying medical conditions, while 36 subjects (67.9%) used xerostomia-inducing drugs. Twenty-five subjects (47.2%) brushed after meals regularly. Eleven subjects (20.8%) wore acrylic removable partial dentures. Thirty-eight subjects (71.7%) and nineteen subjects (35.8%) had dry mouth symptoms and objective dry mouth signs, respectively.

A total of 53 participants were included in this study, six participants were from Chulalongkorn University geriatric clinic with mean age of 71.79±5.72 yr. while forty-seven participants were from Phaholpolpayuhasena hospital elderly club with mean age of 73.17±7.89 yr. The baseline characteristics were similar, except for denture use (100.0% in participants from Chulalongkorn University geriatric clinic vs. 10.6% in participants from Phaholpolpayuhasena hospital) (Table 2).

There was a statistically significant difference in the age of the participants with and without hyposalivation (p=0.009). Both the unstimulated and stimulated salivary flow rates were significantly lower in participants with hyposalivation (p<0.001). The prevalence of objective dry mouth signs was greater in the hyposalivation group (p=0.003), but no difference was observed for subjective dry mouth symptoms (p=0.448). Moreover, there was also no association of salivary flow status with each of eight subjective dry mouth questions (table 3). There was no statistically significant difference in the percentage of xerostomia-inducing drug use, brushing after meal, acrylic removable partial denture used and other medical conditions between the two groups.

Table 1 Characteristics of the study population

Variables	Study population (N=53)	Normal salivation group (N=31)	Hyposalivation group (N=22)	Between-group comparisons
	Mean±SD (Min-Max)	Mean±SD (Min-Max)	Mean±SD (Min-Max)	p-value
Age (years)	71.94±6 (65-92)	70.5±6.1 (65-92)	74.00±5.2 (67-83)	0.009[M]*
Salivary flow rate (ml/min)				
Unstimulated saliva	0.35±0.26 (0.05-1.20)	0.46±0.27 (0.15-1.20)	0.18±0.11 (0.05-0.40)	<0.001[M]*
Stimulated saliva	0.97±0.60 (0.10-3.00)	1.33±0.53 (0.70-3.00)	0.47±0.20 (0.10-0.85)	<0.001[M]*
	N (%)	N (%)	N (%)	
Gender				
Male	8 (15.1)	5 (16.1)	3 (13.63)	1.000[F]
Female	45 (84.9)	26 (83.9)	19 (86.36)	
Systemic conditions				
Cardiovascular diseases	22 (41.5)	11 (35.5)	11 (50)	0.291
Dyslipidemia	8 (15.1)	3 (9.7)	5 (22.7)	0.253[F]
Chronic kidney diseases	5 (9.4)	2 (6.4)	3 (13.6)	0.638[F]
Diabetes mellitus	4 (7.5)	3 (9.7)	1 (4.5)	0.633[F]
Osteoporosis	3 (5.6)	3 (9.7)	0 (0)	0.258[F]
Depressive disorders	3 (5.6)	1 (3.2)	2 (9.1)	0.563[F]
Cerebrovascular diseases	2 (3.7)	0 (0)	2 (9.1)	0.168[F]
Osteoarthritis	2 (3.7)	2 (6.4)	0 (0)	0.505[F]
Spondylolisthesis	2 (3.7)	0 (0)	2 (9.1)	0.168[F]
Parkinson's disease	2 (3.7)	0 (0)	2 (9.1)	0.168[F]
No underlying conditions	19 (35.8)	14 (32.4)	]5 (22.7)	0.093
Xerostomic drug use				
Yes	36 (67.9)	18 (58.1)	18 (81.8)	0.068
No	17 (32.1)	13 (41.9)	4 (18.2)	
Brushing after meal				
Yes	25 (47.2)	13 (42.9)	12 (54.5)	0.365
No	28 (52.8)	18 (58.1)	10 (45.5)	
Dentures use				
Yes	11 (20.8)	7 (22.6)	4 (18.2)	0.745[F]
No	42 (79.2)	24 (77.4)	18 (81.8)	
Subjective dry mouth symptoms				

Yes	38 (71.7)	21 (67.7)	17 (77.3)	0.448
No	15 (28.3)	10 (32.3)	5 (22.7)	
Objective dry mouth signs				
Yes	19(35.8)	6 (19.4)	13 (59.1)	0.003*
No	34(64.2)	25 (80.6)	9 (40.9)	

[M] Mann-Whitney U test

[F] Fisher's Exact Test, otherwise Pearson Chi-Square test

*Statistically significant difference ($p<0.05$)

Table 2 Characteristics of Phaholpolpayuhasena hospital and Chulalongkorn University Clinic

Variables	Study population (N=53)	Phaholpolpayuhasena Hospital (N=47)	Chulalongkorn University Clinic (N=6)
	Mean±SD		
Age (years)	71.94±6	71.79±5.72	73.17±7.89
Salivary flow rate (ml/min)			
Unstimulated saliva	0.35±0.26	0.36±0.27	0.23±0.09
Stimulated saliva	0.97±0.60	1.01±0.62	0.62±0.25
	N (%)		
Gender			
Male	8(15.1)	7(14.9)	1(16.7)
Female	45(84.9)	40(85.1)	5(83.3)
Systemic conditions			
Cardiovascular diseases	22(41.5)	22(46.8)	0
Dyslipidemia	8(15.1)	8(17.0)	0
Chronic kidney diseases	5(9.4)	5(10.6)	0
Diabetes mellitus	4 (7.5)	3(6.3)	1(16.7)
Osteoporosis	3(5.6)	3(6.3)	0
Depressive disorders	3(5.6)	2(4.2)	0
Cerebrovascular diseases	2(3.7)	2(4.2)	0
Osteoarthritis	2(3.7)	2(4.2)	0
Spondylolisthesis	2(3.7)	2(4.2)	0
Parkinson's disease	2(3.7)	2(4.2)	0
No underlying conditions	19(35.8)	14(29.7)	5(83.3)
Salivary flow rate			
Normal	31(58.5)	29(61.7)	2(33.3)
hyposalivation	22(41.5)	18(38.3)	4(66.7)
Xerostomic drug use			
Yes	36 (67.9)	33(70.2)	3(50.0)
No	17 (32.1)	14(29.8)	3(50.0)
Brushing after meal			
Yes	25 (47.2)	19(40.4)	6(100.0)
No	28 (52.8)	28(59.6)	0(0)
Dentures use			
Yes	11 (20.8)	5(10.6)	6(100.0)
No	42 (79.2)	42(89.4)	0(0)
Subjective dry mouth symptoms			
Yes	38 (71.7)	34(72.4)	4(66.7)

No	15 (28.3)	13(27.6)	2(33.3)
Objective dry mouth signs			
Yes	19(35.8)	16(34.1)	3(50.0)
No	34(64.2)	31(65.9)	3(50.0)

Table 3 Associated between salivary status and subjective dry mouth questions

Subjective dry mouth question		Normal salivation group (N=31)	Hyposalivation group (N=22)	Between-group comparisons
	N	N (%)	N (%)	
Question1 Does your mouth feel dry at night or on awakening?				
Yes	29	17(58.62)	12(41.38)	1.000
No	24	14(58.33)	10(41.67)	
Question2 Does your mouth feel dry at other times of the day?				
Yes	25	13(52.00)	12(48.00)	0.413
No	28	18(64.28)	10(35.71)	
Question3 Do you keep a glass of water by your bed?				
Yes	28	14(50.00)	14(50.00)	0.265
No	25	17(68.00)	8(32.00)	
Question4 Do you sip liquids to aid in swallowing any food?				
Yes	19	10(52.63)	9(47.36)	0.570
No	34	21(61.76)	13(38.23)	
Question5 Does your mouth feel dry when eating a meal?				
Yes	21	11(52.38)	10(47.61)	0.572
No	32	20(62.5)	12(37.5)	
Question6 Do you chew gum daily to relieve oral dryness?				
Yes	4	2(50.00)	2(50.00)	1.000[F]
No	49	29(59.18)	20(40.81)	
Question7 Do you use hard candies or mints daily to relieve oral dryness?				
Yes	13	8(61.54)	5(38.46)	1.000
No	40	23(57.5)	17(42.5)	

Question8 Does the amount of saliva in your mouth seem to be too little?				
Yes	18	8(44.44)	10(55.56)	0.155
No	35	23(65.71)	12(34.28)	

[F] Fisher's Exact Test, otherwise Pearson Chi-Square test

Factors associated with salivary flow rate

We also examined the factors that may associate with salivary flow rates (Table 4). Mean USFR and mean SFR in participants with objective dry mouth signs (0.24±0.25 ml/min and 0.72±0.39 ml/min, respectively) were significantly lower than those without (0.41±0.25 ml/min and 1.12±0.55 ml/min, respectively) (p=0.003 for both). In contrast, no statistical difference in mean USFR and SFR was observed between participants with subjective dry mouth symptoms and those without (p=0.118 and 0.188, respectively). Furthermore, mean USFR and SFR of *Candida* carriers (0.27±0.23 and 0.77±0.56 ml/min, respectively) were significantly lower than those of non-*Candida* carriers (0.40±0.27 and 1.16±0.59 ml/min, p=0.042 and 0.007, respectively). In addition, mean SFR was lower in participants who used xerostomic drugs (0.89±0.61 ml/min) than those who did not (1.15±0.56 ml/min), but the difference was only statistically marginally significant (p=0.053). There was no statistically significant difference with regards to other factors examined.

Table 4 Association of population characteristics and salivary flow rate

	Unstimulated salivary flow rate (ml/min)			Stimulated salivary flow rate (ml/min)		
	N	Mean±SD	P-value	N	Mean±SD	P-value
Gender						
Male	8	0.33±0.21	0.891	8	1.15±0.56	0.262
Female	45	0.34±0.27		45	0.94±0.61	
Xerostomic drug use						
Yes	36	0.34±0.27	0.485	36	0.89±0.61	0.053
No	17	0.36±0.24		17	1.15±0.56	
Subjective dry mouth symptoms						
Yes	38	0.31±0.25	0.118	38	0.92±0.62	0.188
No	15	0.42±0.27		15	1.12±0.56	
Objective dry mouth signs						
Yes	19	0.24±0.25	0.003*	19	0.72±0.39	0.003*
No	34	0.41±0.25		34	1.12±0.55	
Denture use						
Yes	11	0.38±0.29	0.628	11	0.93±0.54	1.000
No	42	0.34±0.25		42	0.99±0.62	
Candida spp.						
Yes	25	0.27±0.23	0.042*	25	0.77±0.56	0.007*
No	28	0.40±0.27		28	1.16±0.59	
Non-*albicans*						
Yes	13	0.32±0.29	0.487	13	0.75±0.59	0.078
No	40	0.35±0.25		40	1.05±0.60	
Multiple species						
Yes	9	0.32±0.59	0.739	9	0.72±0.63	0.073
No	44	0.35±0.26		44	1.03±0.59	

Mann-Whitney U test

*Statistically significant difference ($p<0.05$)

Oral *Candida* species colonization

The prevalence of oral *Candida species* is shown in Table 5. Overall, 25 participants (47.2%) were *Candida* carriers. *C. albicans* was the most commonly detected species (76% of *Candida* carriers), while non-*albicans species* were detected in 52% of *Candida* carriers. Colonization by multiple species (multispecies) was detected in 36% of *Candida* carriers. *C. glabrata* was the most common non-*albicans Candida species* detected (20% of *Candida* carriers), followed by *C. dubliniensis, C. parapsilosis, C. krusei and C. tropicalis* (16%, 16%, 8%, and 4% of *Candida* carriers, respectively). When compared between normal salivation and hyposalivation groups, we found significantly higher *Candida* colonization in hyposalivation group (68.2%) than the normal salivation group (32.3%) (p=0.010), with odds ratio of 4.500 (95% confidence interval=1.395-14.518, p=0.012). Since there was a significant difference in the age of participants in the hyposalivation and normal salivation groups, we analyzed for the effect of age in logistic regression. Hyposalivation was still associated with higher prevalence of *Candida* colonization when controlled for age with adjusted odds ratio of 4.360 (95% confidence interval=1.292-14.717, p=0.018). There was no statistically significant difference in the prevalence of multi-species or non-*albican*s *Candida species* between groups, except for *C. parapsilosis* (p=0.025).

Table 5 Association of oral Candida colonization and salivation status

Candida species	Study population (N=53) N (%)	*Candida* carriers (N=25) N (%)	Normal salivation group (N=31) N (%)	Hyposalivation group (N=22) N (%)	Between-group p-value
Candida spp.	25 (47.2)	25 (100)	10 (32.3)	15 (68.2)	0.010*
C. albicans	19 (35.8)	19 (76)	8 (25.8)	11 (50.0)	0.070
Multispecies	9 (17)	9 (36)	3 (9.7)	6 (27.27)	0.140[F]
Non-*albicans*	13 (24.5)	13 (52)	5 (16.1)	8 (36.4)	0.092
C. glabrata	5 (9.4)	5 (20)	2 (6.5)	3 (13.6)	0.638 [F]
C. dubliniensis	4 (7.5)	4 (16)	1 (3.2)	3 (13.6)	0.295 [F]
C. parapsilosis	4 (7.5)	4 (16)	0 (0)	4 (18.18)	0.025* [F]
C. krusei	2 (3.8)	2 (8)	2 (6.5)	0 (0)	0.505 [F]
C. tropicalis	1 (1.9)	1 (4)	1 (3.2)	0 (0)	1.000 [F]

[F] Fisher's Exact Test, otherwise Pearson Chi-Square test

*Statistically significant difference ($p<0.05$)

Factors associated with *Candida* colonization and *Candida* counts

We compared the prevalence of *Candida* colonization to determine the factors that may associate with risk of *Candida* carriage (Table 6). *Candida* colonization was higher in participants with objective dry mouth signs (p=0.021) and hyposalivation (p=0.010). In contrast, gender, xerostomic drug use, subjective dry mouth symptoms, brushing, denture use, nor systemic conditions did not show statistically significant difference. Interestingly, denture use was associated with higher prevalence of non-*albicans Candida* colonization (p=0.017). When we examined the quantity of *Candida* among *Candida* carriers (Table 8), we found that participants with subjective dry mouth symptoms had significantly higher number of *Candida* in the saliva than those without the symptoms (3.55±0.75 vs. 2.82±0.37 logCFU/ml, p=0.025). Participants who used xerostomic drugs, and those who used dentures tended to have higher number of *Candida*, but the difference was not statistically significant. (p=0.173 and 0.091, respectively)

Interestingly, denture use was associated with higher prevalence of non-*albicans Candida* colonization (p=0.017) and higher prevalence of *Candida spp*. colonization (p=0.056). Contrarily, our study found no significantly difference between mean Denture plaque index (DPI) of *Candida* carriers and non-*Candida* carriers (p=1.000) (table 7), we also found no correlation between *Candida* count and DPI (p=0.259) (Figure 1E)

Although categorical salivation status (normal vs hyposalivation) did not show significant association with the quantity of *Candida* colonization (Table 8), we observed statistically significant negative correlations between *Candida* count and unstimulated salivary flow rate (USFR) (r=-0.336, p=0.014) (Figure 1A) and between *Candida* count and stimulated salivary flow rate (SFR) (r=-0.436, p=0.001) (Figure 1B). These findings suggested that low unstimulated and stimulated salivary flow rates correlate with higher amounts of *Candida* colonization.

Table 6 Association of clinical parameters and Candida colonization (N=53)

		Candida		Non-*albicans*		Multispecies	
	N	N=25(%)	P-value	N=13(%)	P-value	N=9(%)	P-value
Gender							
Male	8	3 (37.50)	0.708[F]	0 (0)	0.176[F]	0 (0)	0.324[F]
Female	45	22 (48.88)		13 (28.00)		9 (20.00)	
Xerostomic drug use							
Yes	36	18 (50.00)	0.548	7 (19.44)	0.306[F]	5 (13.88)	0.445[F]
No	17	7 (41.17)		6 (35.29)		4 (23.53)	
Subjective dry mouth symptoms							
Yes	38	20 (52.63)	0.205	10 (26.31)	0.736[F]	8 21.05)	0.418[F]
No	15	5 (33.33)		3 (20.00)		1 (6.66)	
Objective dry mouth signs							
Yes	19	13 (68.42)	0.021*	7 (36.84)	0.183[F]	5 (26.32)	0.255[F]
No	34	12 (35.29)		6 (17.65)		4 (11.76)	
Salivation status							
Normal	31	10 (32.26)	0.010*	5 (167.13)	0.092	3 (9.67)	0.140[F]
Hyposalivation	22	15 (68.18)		8 (36.36)		6 (27.27)	
Brushing after meal							
Yes	25	14 (56.00)	0.224	7 (28.00)	0.579[F]	5 (20.00)	0.719[F]
No	28	11 (39.28)		6 (21.43)		4 (14.28)	
Denture use							
Yes	11	8 (71.72)	0.056	6 (54.54)	0.017*[F]	4 (36.36)	0.076[F]
No	42	17 (40.47)		7 (16.67)		5 (11.90)	
Systemic conditions							
Yes	34	17 (50.00)	0.581	6 (17.65)	0.183[F]	4 (11.76)	0.255[F]
No	19	8 (42.11)		7 (36.84)		5 (26.31)	

[F] Fisher's Exact Test, otherwise Pearson Chi-Square test

*Statistically significant difference ($p<0.05$)

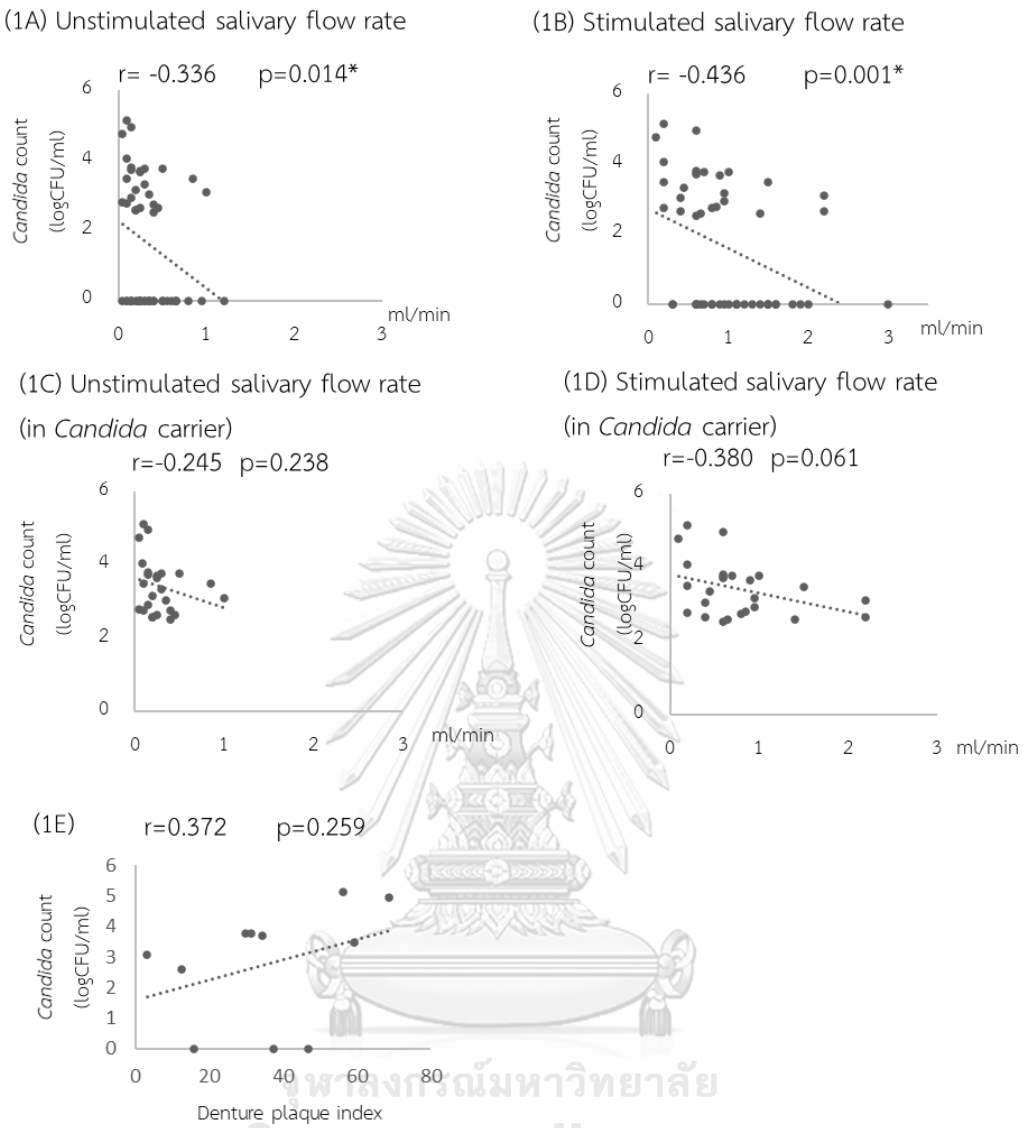


Figure 1.

Correlation between salivary flow rates (1A, 1C for unstimulated and 1B, 1D for stimulated) and the quantity of Candida colonization. Correlation between salivary flow rates the quantity of Candida colonization and denture plaque index (1E). Data were analyzed with Spearman correlation coefficient analysis. The r and p-value of each correlation are shown.

*Statistically significant difference ($p<0.05$)

Table 7 Association of Denture plaque index (DPI) and Candida colonization(N=8)

Candida species	N	Denture plaque index	
		Mean±SD	p-value
Candida spp.			
Yes	8	36.93±23.05	1.000
No	3	33.33±16.04	
Non-*albicans*			
Yes	6	32.55±22.63	0.465
No	5	40.04±19.67	

Mann-Whitney U test

*Statistically significant difference ($p<0.05$)

Table 8 Association of clinical parameters and quantity of Candida colonization (logCFU/ml) among Candida carriers (N=25)

		Candida counts (logCFU/ml)	
	N	Mean±SD	P-value
Gender			
Male	3	2.90±0.39	0.181
Female	22	3.47±0.76	
Xerostomic drug use			
Yes	18	3.54±0.79	0.173
No	7	3.05±0.50	
Subjective dry mouth symptoms			
Yes	20	3.55±0.75	0.025*
No	5	2.82±0.37	
Objective dry mouth signs			
Yes	13	3.65±0.87	0.182
No	12	3.14±0.52	
Salivation status			
Normal	10	3.18±0.46	0.360
Hyposalivation	15	3.55±0.87	
Brushing after meal			
Yes	14	3.17±0.68	0.125
No	11	3.59±0.77	
Denture use			
Yes	8	3.81±0.86	0.091
No	17	3.21±0.63	
C. albicans			
Yes	19	3.47±0.73	0.265
No	6	3.19±0.83	
Non-*albicans*			
Yes	13	3.35±0.82	0.479
No	12	3.46±0.70	
Multiple species			
Yes	9	3.54±0.90	0.734
No	16	3.33±0.66	

Mann-Whitney U test

*Statistically significant difference ($p<0.05$)

Factors associated with oral health status

Oral health status of the study population was evaluated by oral examination and measurement of the gingival index (GI), tongue coating index (TCI), and root caries index (RCI) (Table 9). Participants with hyposalivation had significantly higher mean GI and TCI (p=0.003 and 0.015 respectively), but not RCI (p=0.986). Likewise, participants with objective dry mouth signs had significantly higher GI that those without the signs (p=0.012). However, the presence of objective dry mouth signs was not associated with TCI (p=0.307) nor RCI (p=0.479). The presence of *Candida* was not associated with any of the indices. Interestingly, none of the factors examined has significant relationship with RCI. Nevertheless, participants who wear dentures tended to have higher RCI with marginally significant difference (p=0.054).

In addition, as shown in Figure 2, we found significant negative correlations between GI and USFR (r=-0.387, p=0.004) and also between GI and SFR (r=-0.371, p=0.006) (Figure 2A and 2B). Moreover, there were significant negative correlations between TCI and USFR (r=-0.271, p=0.049) and between TCI and SFR (r=-0.359, p=0.008) (Figure 2C and 2D). However, no correlation was observed between RCI and salivary flow rates (Figure 2E and 2F). These findings suggested that high GI and TCI correlate with low unstimulated and stimulated salivary flow rates.

Table 9 Association of clinical parameters and oral health indices

	N	Gingival index		Tongue coating index		Root caries index	
		Mean±SD	P-value	Mean±SD	P-value	Mean±SD	P-value
Salivation status							
Normal	31	0.96±0.24	0.003*	13.35±13.73	0.015*	10.28±5.98	0.986#
Hyposalivation	22	1.25±0.40		28.28±22.02		10.32±5.02	
Subjective dry mouth							
symptoms	38	1.11±0.36	0.452	21.63±18.89	0.096	10.78±5.46	0.330#
Yes	15	0.99±0.29		14.26±18.75		9.06±5.76	
No							
Objective dry mouth signs							
Yes	19	1.25±0.41	0.012*	22.51±18.09	0.307	9.61±4.56	0.479#
No	34	0.99±0.27		17.89±19.50		10.67±6.06	
Brushing after meal							
Yes	25	1.05±0.27	0.724	19.78±18.57	0.634	10.58±6.61	0.728#
No	28	1.11±0.40		19.34±19.63		10.03±4.51	
Denture use							
Yes	11	1.02±0.14	0.832	22.22±16.10	0.298		0.054#
No	42	1.09±0.38		18.84±19.76		13.33±5.45	
						9.49±5.35	
Candida spp.							
Yes	25	1.16±0.38	0.169	21.89±19.78	0.305	10.51±5.34	0.789#
No	28	1.00±0.30		17.46±18.31		10.09±5.82	
Non-*albicans*							
Yes	13	1.19±0.46	0.294	21.37±18.68	0.471	12.07±5.32	0.184#
No	40	1.04±0.30		18.96±19.25		9.71±5.56	
Multiple species							
Yes	9	1.13±0.22	0.427	20.98±17.52	0.526	13.05±5.73	0.137#
No	44	1.07±0.37		19.25±19.43		9.72±5.40	

#Independent t-test, otherwise Mann-Whitney U test

*Statistically significant difference ($p<0.05$)

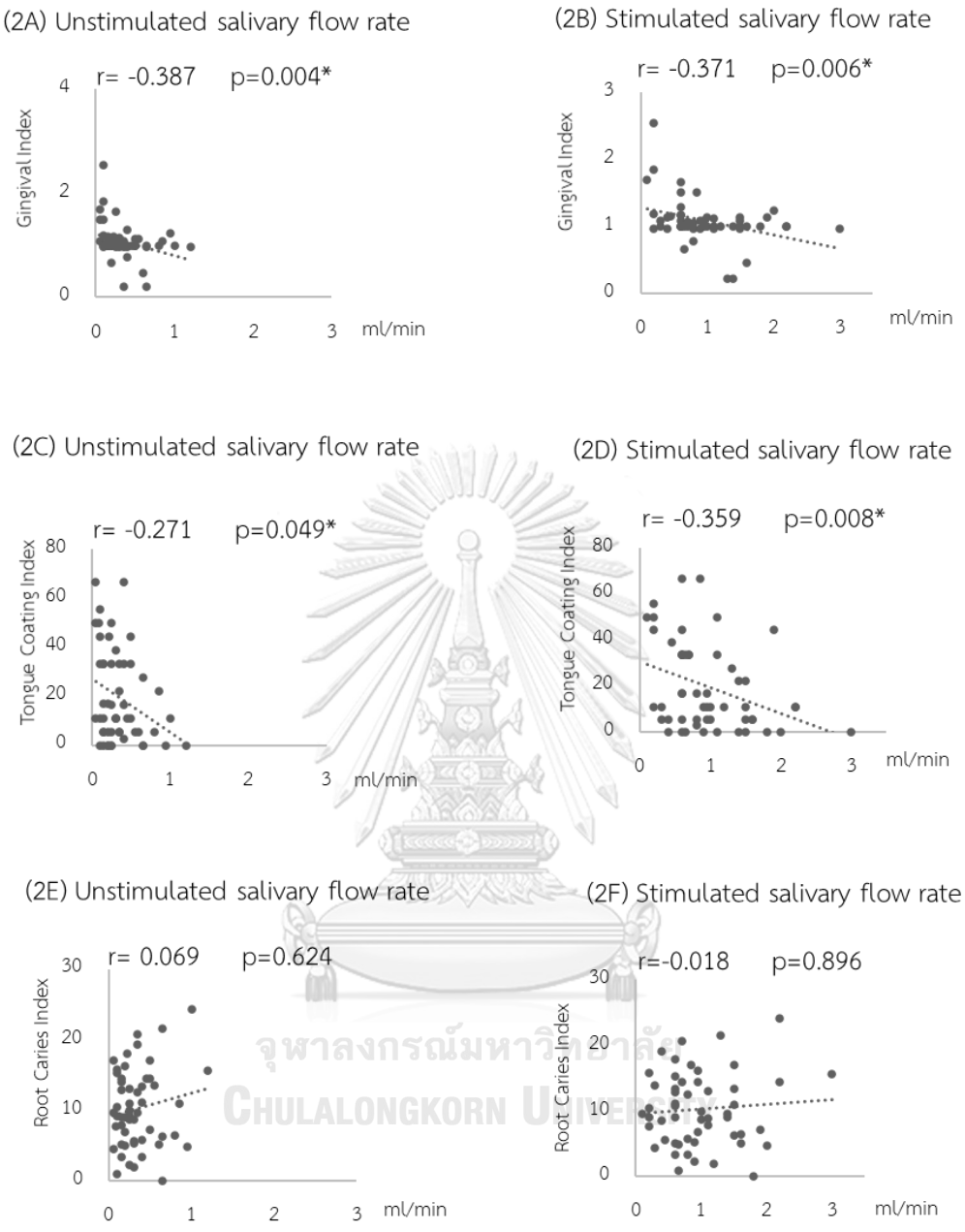


Figure 2

Correlation between salivary flow rates (2A, 2C for unstimulated and 2B, 2D for stimulated) and gingival index (2A, 2B), tongue coating index (2C, 2D), and root caries index (2E, 2F). Data were analyzed with Spearman correlation coefficient analysis. The r and p-value of each correlation are shown.

*Statistically significant difference ($p<0.05$)

Association of systemic diseases and *Candida* colonization

There was no statistically significant difference of *Candida species*, *C. albicans,* non-*albicans* and multispecies among subjects with other medical illness (cardiovascular disease, chronic kidney disease, osteoporosis, depressive disorder, cerebrovascular disease, dyslipidemia, Asthma, osteoarthritis, hyperplasia of prostate, Spondylolisthesis, thyrotoxicosis, and Parkinson's disease) and subjects without the particular illness (Table 10).

The prominent *Candida species* in diabetic subjects was non-*albicans* (75%), followed by *C. albicans* (25%), and multispecies (25%). In non-diabetics it was *C. albicans* (36.73%) followed by non-*albicans* (20.41%) and multispecies (16.33%). There was a significantly higher prevalence of non-albicans in diabetic subjects (75%) than in non-diabetic subjects (20.40%) (p=0.042) but no statistically significant difference in the percentage of *Candida* carrier, *C. albicans* and multispecies between diabetics and non-diabetic were observed (table 10).

Table 10 Association of systemic diseases and Candida colonization (N=53)

	N	*Candida spp.*		*C. albicans*		Non-*albicans*		Multispecies	
		N=25(%)	P-value	N=19 (%)	P-value	N=13 (%)	P-value	N =9 (%)	P-value
Cardiovascular disease									
Yes	22	9(40.91)	0.442	7(31.82)	0.606	4(18.18)	0.366	2(9.09)	0.277[F]
No	31	16(51.61)		12(38.71)		9(29.03)		7(22.58)	
Chronic kidney disease									
Yes	5	1(20.00)	0.355[F]	1(20.00)	0.643	0(0.00)	0.317 [F]	0(0.00)	0.574[F]
No	48	24(50.00)		18(37.5)		13(27.08)		9(18.75)	
Osteoporosis									
Yes	3	0(0.00)	0.238[F]	0(0.00)	0.545	0(0.00)	0.567[F]	0(0.00)	0.637[F]
No	50	25(50.00)		19(38.00)		13(26.00)		9(18.00)	
Depressive disorder	3	3(100.00)	0.098[F]	2(66.66)	0.290	2(66.66)	0.145[F]	1(33.33)	0.435[F]
Yes	50	22(44.00)		17(343.00)		11(22.00)		8(16.00)	
No									
Diabetes mellitus									
Yes	4	3(75.00)		1(25.00)	1.000	3(75.00)	0.042[F*]	1(25.00)	0.536[F]
No	49	22(44.89)	0.333[F]	18(36.73)		10(20.41)		8(16.33)	
Cerebrovascular disease									
Yes	2	2(100.00)	0.218[F]	2(100.00)	0.124	0 (0.00)	1.000[F]	0(0.00)	1.000[F]
No	51	23(45.09)		17(33.33)		13(25.49)		9(17.65)	
Dyslipidemia									
Yes	8	2(25.00)	0.256[F]	2(25.00)	0.487	0(0.00)	0.176[F]	0(0.00)	0.324[F]
No	45	23(51.11)		17(37.77)		13(28.89)		9(20.00)	
Asthma									
Yes	1	1(100.00)	0.472[F]	1(100.00)	0.358	0 (0.00)	1.000[F]	0(0.00)	1.000[F]
No	52	24(46.15)		18(34.61)		13(25.00)		9(17.30)	
Osteoarthritis									
Yes	2	1(50.00)	1.000[F]	1(50.00)	1.000	0 (0.00)	1.000[F]	0(0.00)	1.000[F]
No	51	24(47.05)		18(35.29)		13(25.49)		9(17.65)	
Hyperplasia of prostate									
Yes	1	(100.00)	1.000[F]	1(100.00)	0.385	0 (0.00)	1.000[F]	0(0.00)	1.000[F]
No	52	24(46.13)		18(34.62)		13(25.00)		9(17.31)	
Spondylolisthesis									

Yes	2	2(8.00)	0.218[F]	2(10.53)	0.124	0 (0.00)	1.000[F]	0(0.00)	1.000[F]
No	51	23(92.00)		17(89.47)		13(100.00)		9((100.00)	
Thyrotoxicosis									
Yes	1	0(0.00)	1.000[F]	0(0)	1.000	0 (0.00)	1.000[F]	0(0.00)	1.000[F]
No	52	25(48.08)		19(36.54)		13(25.00)		9(17.30)	
Parkinson's									
disease	2	1(50.00)	1.000[F]	0(0)	0.531	1 (50.00)	0.434[F]	1(50.00)	0.313[F]
Yes	51	24(47.06)		19(37.25)		12(23.53)		8(15.67)	
No									

[F] Fisher's Exact Test, otherwise Pearson Chi-Square test

*Statistically significant difference ($p<0.05$)

DISCUSSION

In this study, we studied factors that affect salivary flow rate and hyposalivation. We found that salivary flow rate was not significantly different between male and female. The prevalence of hyposalivation was 41.5% and prevalence of subjective dry mouth sign was 71.1%. There was no association between hyposalivation and subjective dry mouth sign and systemic disease whereas hyposalivation associated with objective dry mouth symptoms. When examined the relationship of hyposalivation to oral *Candida* carriage and oral health in a population of generally healthy Thai elders. We found that oral *Candida* colonization was higher in participants with hyposalivation both in univariate analysis and after adjusted for age. Hyposalivation was also associated with higher gingival and tongue coating indices, but not root caries index. These two indices and the quantity of oral *Candida* load were also negatively correlated with salivary flow rates. Our findings indicate that hyposalivation is a major risk factor for oral *Candida* colonization and poorer oral health in a relatively healthy elderly population

Three hundred and fifty patients from recall waiting list of graduate geriatric clinic at the faculty of dentistry, Chulalongkorn University and Phaholpolpayuhasena hospital elderly club were initially screened. In total, 53 participants who satisfied the criteria were included in the study. The others were excluded mostly because they had less than 4 pairs of posterior occlusal contact. Six participants were from Chulalongkorn University Clinic in Bangkok, while forty-seven participants were from Phaholpolpayuhasena hospital elderly club in Kanchanaburi, with comparable mean age of 71.79±5.72 yr. and 73.17±7.98 yr., respectively. Other characteristics between the 2 groups were similar except for denture use (100.0% in participants from Chulalongkorn University geriatric clinic vs. 10.6% in participants from Phaholpolpayuhasena hospital) (Table 2).

The mean USFR (unstimulated whole salivary flow rates) and mean SFR (stimulated whole salivary flow rates) (N=53) were 0.35±0.26 ml/minute and 0.97±0.60 ml/minute, respectively. These are around the previously reported mean unstimulated flow rate of 0.3-0.4 ml/min. and mean stimulated flow rate of between 1-2 mL/min[55, 59, 102]. Previous studies related to gender and flow rate found that a USFR and SFR in

male was significantly higher than in female[55, 59, 103-105]. Anyway, the USFR and the SFR in our study were not significantly different between male and female. This study showed that mean age of hyposalivation group was significantly higher than the normal group (P=0.009) suggesting a tendency toward age-related declining secretion. There was controversy about relationship between age and salivary flow rate. Recent meta-analysis of saliva flow rate suggested that whole unstimulated and stimulated, submandibular and sublingual salivary flow rates decreased with ageing, but not that of parotid gland and minor gland salivary flow rates[106]. Additionally, some studies in healthy non-medicated subjects showed age-related decrease in flow rate[41, 66, 68, 107].

Wiener RC. et al. (2010) reported 11.1% of participants 70 years and older had hyposalivation, based on assessment of hyposalivation which was defined as an unstimulated salivary flow rate of less than 0.1 ml/min[59]. The prevalence of hyposalivation in our study (41.5%) was higher than Wiener RC. et al. (2010) (11.1 %) because our study defined hyposalivation from both USFR and SFR therefore the prevalence of hyposalivation in our study appeared in high ratio. Of note, we included hyposalivation from USFR and SFR, each individual with “hyposalivation” might had low USFR (but normal SFR) or low SFR (but normal USFR) or low UFR and low SFR. The prevalence of 20%-26% xerostomia in an older population had been reported[108, 109] .

In our study, the prevalence of subjective dry mouth symptoms was 71.7% and prevalence of objective dry mouth sign was 35.8%. There was no association between hyposalivation and subjective dry mouth symptoms (p=0.448) whereas hyposalivation associated with objective dry mouth signs (p=0.003). Our study also showed no statistically different mean USFR and SFR between participants with and without subjective dry mouth symptoms (p=0.118) (p=0.188), respectively. While there were statistical differences mean USFR and SFR between subjects with and without objective dry mouth signs (p=0.003, p=0.003), respectively.

The most frequent subjective dry mouth symptoms were positive response to: “ Does your mouth feel dry at night or on awakening?” (sensitivity(0.545), specificity(0.452), positive predictive value(0.414) and negative predictive value(0.583)”),“Do you keep a glass of water by your bed?”(sensitivity(0.636), specificity(0.548), positive predictive value(0.500) and negative predictive value(0.680))

and “Does your mouth feel dry at other times of the day?”(sensitivity(0.545), specificity(0.581), positive predictive value(0.480) and negative predictive value(0.643)). There was also no association between hyposalivation and any of the eight subjective dry mouth symptoms questions (table 3). The most frequent objective dry mouth signs were “loss of papillae of the tongue dorsum” (sensitivity(0.500), specificity(0.806), positive predictive value(0.647) and negative predictive value(0.581)) and “sticking of an intraoral mirror to the buccal mucosa or tongue”(sensitivity(0.090), specificity(0.935), positive predictive value(0.500) and negative predictive value(0.584)). These indicated that subjective dry mouth alone was not a sensitive measurement of salivary hypofunction while objective dry mouth symptoms such as “loss of papillae of the tongue dorsum” and “sticking of an intraoral mirror to the buccal mucosa or tongue” may be a very specific useful tool to assess the effects of salivary hypofunction and mucosal dryness. Additionally, the objective dry mouth signs were easy to perform in clinical setting and might be a suitable tool for screening patient at risk of hyposalivation in the elders. In our study, statistical measures of the performance of an individual question showed overall low values of sensitivity, specificity, positive predictive value and negative predictive value. It is interesting to use severity grading scale or continuous grading scale and evaluate their performance in the future research.

Individual who complained about dry mouth may express their symptoms or respond to questions differently. In this study, we found that, these subjective symptoms might not indicate their salivary gland hypofunction. Moreover, different questions produced different results[110, 111]and it was no possible to grade the severity of xerostomia. Various types of multiple item questionnaire with either “yes” or “no” answer, with grading severity scale (The Xerostomia Inventory scoring system[112]) or with continuous grading scale (Visual Analog Scale[113]) may be useful for monitoring the progress of salivary gland dysfunction and its complication over time. Moreover, it also enable evaluation of the effectiveness of therapeutic intervention.

Our study showed marginally significant different mean SFR in xerostomic drug user (p=0.053). Moreover, the result showed no significant percentage difference of hyposalivation in individual with and without systemic diseases (p=0.093). The meta-

analysis found that systemic disease and medication use were significantly associated with xerostomia and salivary gland hypofunction in elderly[114]. Furthermore, medications acting on almost all systems of the body may also cause side effects related to the salivary system[115]. Additionally, persons with systemic disorders and on medications demonstrated significantly lower salivary flow rates and also the higher prevalence of salivary hypofunction[60, 116-119].

The prominent *Candida species* in diabetic subjects was non-*albicans* (75%), followed by *C. albicans* (25%), and multispecies (25%). In non-diabetics it was *C. albicans* (36.73%) followed by non-*albicans* (20.41%) and multispecies (16.33%). There was a significantly higher prevalence of non-*albicans* in diabetic subjects (75%) than in non-diabetic subjects (20.40%) (p=0.042) but there was no statistically significant difference in the percentage of *Candida* carrier, *C. albicans* and multispecies between diabetics and non-diabetics. These findings was different from the commonly observed higher prevalence of *C. albicans* in diabetics[120]. Evidences in some studies suggest pathogenic synergism between *C. albicans* and other *Candida species* [121-123]. Furthermore, several species of NACS are intrinsically more resistant, or could frequently develop resistance, to the commonly used antifungal drugs, and may cause refractory candidiasis[124]. Therefore, the diabetic subjects in our study group may prone to more difficult eradication if they developed clinical disease.

We observed oral *Candida* colonization in 47.2% of this elderly population, 76% and 52% of whom had *C. albicans* and non-*albicans Candida species*, respectively. The overall prevalence was similar to previous reports of 25.7%–55% *Candida* colonization in healthy population of various age groups, but the prevalence of NACS in this study (24.5% of the population, 52% of *Candida* carriers) was relatively high when compared to 0%–30% in other studies[125-127]. The most frequently isolated NACS in this study was *C. glabrata*, followed by C. *dubliniensis, C. parapsilosis, C. krusei*, and only 1 case of *C. tropicalis* (Table 5). This finding differs from previous reports that suggested distinct geographical distribution of *Candida species*, where *C. glabrata and C. parapsilosis* were commonly detected in North America, while *C. tropicalis* was more prevalent in Asia-Pacific[22]. However, it has been suggested that age-related compromising conditions favoured *C. glabrata* colonization in the

elderly[128]. A previous study in japanese community dwelling elders also reported that *C. albicans, C. glabrata*, and *C. dubliniensis* dominated the oral mycobiome[129]. Colonization by distinct species of *Candida* may have different effects on oral health. Interestingly, multi-species colonization by *C. albicans, C. glabrata, C. tropicalis, and C. krusei* was associated with atrophic mucosa in patients with xerostomia[130]. There was a significantly higher prevalence of non-albicans in diabetic subjects (75%) than in non-diabetic subjects (20.40%) (p=0.042) Furthermore, several species of NACS are intrinsically more resistant, or could frequently develop resistance, to the commonly used antifungal drugs, and may cause refractory candidiasis[124] . Since *Candida* colonized in the oral cavity could serve as a reservoir for oral and systemic infections when host immunity becomes compromised, the prevalence of oral carriage of *Candida*, especially of NACS, in the elderly is of concern[25]. Therefore, identification of risk factors associated with oral *Candida* colonization, especially of NACS, is important. There was a significantly higher prevalence of non-albicans in diabetic subjects (75%) than in non-diabetic subjects (20.40%) (p=0.042).

In our study, we found significantly higher prevalence of *Candida* colonization in the hyposalivation group (68.2% vs. 32.3% in control, p=0.010; adjusted OR=4.36) and *Candida* carriage was associated with lower salivary flow rates (Table 4, p=0.042 and 0.007 for USFR and SFR, respectively). We also observed significant negative correlations between salivary flow rates and the quantity of *Candida* in the oral cavity (Figure 1A and 1B). These are consistent with previous reports that decreased salivary flow rate is a risk factor for *Candida* colonization[71, 130-133]. Of note, patients with higher *Candida* counts were shown to have higher risk for candidiasis[25, 134, 135]. An animal study showed that *Candida* could induce bacterial dysbiosis that facilitates mucosal invasion and infection[136]. At the same time, high *Candida* load was also associated with low microbiome diversity that dominated by saccharolytic and acidogenic bacterial species in the saliva of elderly[137]. This suggests that conditions that favor high level of *Candida* carriage also affect other microorganisms that influence other aspects of oral health.

We observed significant associations between hyposalivation and higher gingival and tongue-coating indices (Table 9, p=0.003 and 0.015, respectively). Moreover, we

also found that salivary flow rates negatively correlated with gingival and tongue-coating indices (Fig 2A, 2B, 2C and 2D). However, we did not find any significant association with the root caries index (RCI) as the exclusion criteria are oral infection, such as periodontitis or candidiasis, may reflect low value of RCI. Therefor the related statistical result may be affected.

In this study, we defined hyposalivation as having unstimulated salivary flow rate of less than 0.1 mL per minute or stimulated salivary flow rate of less than 0.7 mL per minute[99, 100, 138]. The reduced salivary flow could lead to reduced clearance and decreased immune components against oral microorganisms, which result in oral microbial dysbiosis, increased plaque accumulation and *Candida* adherence to the oral mucosa[15, 16, 132]. Thus, hyposalivation could lead to gingival inflammation and adversely affect oral and systemic health; these are particularly important for the elderly[16]. Furthermore, oral microorganisms could be transferred to the gut, and this transition was found to be higher in the elderly, suggesting that gut microbiota and systemic health could be affected by oral microbiota[139].

Interestingly, we observed a significant association between denture use and NACS colonization. (Table 6, p=0.017) This is consistent with our previous study in xerostomic post-radiotherapy Head and Neck cancer patients[21]. The use of denture was associated with a higher *Candida* colonization rate in Mexican elderly women, with many isolates showing resistance to fluconazole[140]. *Candida* has the ability to form biofilm on the rough and porous surface of acrylic denture base[141]. Poor denture hygiene allows microbial accumulation leading to mucosal inflammation and infection in denture stomatitis[20, 141]. Thus, appropriate denture cleaning protocols should be recommended and the use of non-toxic agent with antifungal activity may provide additional benefit[142]. In this study, we focused on relatively healthy elderly population with well-controlled systemic diseases to gain information on the effects of hyposalivation on oral *Candida* carriage and oral health status. This helps to minimize the effects of other potential confounding factors.

In addition, existing oral microbiota in the oral cavity of the elderly could serve as a reservoir of important opportunistic pathogens when the host immunity is compromised[25]. Thus, information on oral *Candida species* in the elderly could be a

marker for risk of developing candidiasis. The early detection of *Candida* using whole saliva culture require longer chair time, more complicated procedure, not site specific but it is sensitive for detecting viable *Candida* carriage, CFU can readily be calculated and at the same time flow rate can be recorded for monitoring the patient at risk[143]. The oral swap is simple, site specific and is suitable for isolation viable *Candida* for diagnosing oral candidiasis[143]. The detection of NACS and multi-species colonization in this study was facilitated by the use of chromogenic *Candida* agar and PCR for species identification to ensure the accuracy. However, this study still carries certain limitations. This is a cross sectional study in a small group of participants. It would be interesting to examine the relationships in longitudinal studies and to identify effective interventions to mitigate these effects.

Since the results from this study showed that the *Candida spp*. colonization was associated not only with hyposalivation but also with partial denture wearing, therefore the further study is to find out the association of these two factors and the *Candida spp*. colonization. Moreover, studies in a large number of denture wearer are required to examine the relationship between denture hygiene and *Candida* colonization.

CONCLUSION

Within the limitations of this study, we conclude that hyposalivation is a risk factor for oral *Candida* colonization and poorer oral health in generally healthy elders. These could adversely affect their oral and systemic health; thus we suggest that hyposalivation should be carefully clinically monitored in the elderly population. Interventions to alleviate the effects of hyposalivation may be beneficial in these patients.

APPENDIX

APPENDIX A

Questionnaire form

Name_____	HN_____	Subject number_____
1.Demographic information		
Age ☐ 65-70 ☐ 71-75 ☐ 76-80 ☐ More than 80	Gender ☐ man ☐ woman	Education ☐ Primary school ☐ High school ☐ University
2. Medical history		

Do you have any systemic disease?

☐ Hypertension

What was your most recent blood pressure result?

☐ under 120 / 80 mmHg

☐ 120-139 / 80-89 mmHg

☐ 140-159 / 90-99 mmHg

☐ 160-179 / 100-109 mmHg

☐ more than 180 / 110 mmHg

☐ Diabetes mellitus

What was your recent Fasting blood sugar?

☐ 80-100 mg/dl

☐ 100-125 mg/dl

☐ more than 126 mg/dl

☐ don't know

What was your recent HbA1c?

☐ 4-6 %

☐ more than 7%

☐ don't know

☐ Other medical disease _____

Are you taking any medication

☐ Anticholinergic drugs ☐ Antihypertensive drugs

☐ Diuretic drugs ☐ Sedative and anxiolytic drugs

☐ Muscle relaxant drugs ☐ Antihistamines drugs

☐ NSAID

☐ other medication _____

3. Smoking status

☐ Never ☐ Former smoker ☐ Current smoker

____ number of cigarettes consumed per day

____ number of years you smoked

Questionnaire form (continue)

<table>
<tr><td colspan="2">4. Oral hygiene practice</td></tr>
<tr><td>Frequency of brushing per day
☐ Never
☐ Once
☐ Two time or more
Regular tooth brushing after meals
☐ Yes
☐ No</td><td>Material used for brushing
☐ None
☐ Toothpaste
☐ Antibiotic mouth rinse
Interdental cleansing
☐ None
☐ Dental floss
☐ Proximal brush</td></tr>
<tr><td colspan="2">5. Denture information</td></tr>
<tr><td>Type of denture
☐ Acrylic based partial denture
☐ Upper
☐ Lower
☐ Non acrylic based partial denture
☐ Fixed prosthesis
☐ Upper
☐ Lower
☐ metal base partial denture
☐ Upper
☐ Lower
Age of denture (years)
☐ 0-3
☐ 4-6
☐ more than 7</td><td>Frequency of cleaning per day
☐ Never
☐ Once
☐ Two time or more
Method of cleaning
☐ Brushing
☑ Soaking
Materials used for brushing
☐ Only water
☐ Soap / dishwashing liquid
☐ Toothpaste
Overnight denture wearing
☐ Yes
☐ No</td></tr>
<tr><td colspan="2">6. Dry mouth information</td></tr>
<tr><td>Does your mouth feel dry at night or on awakening?
☐ Yes
☐ No
Does your mouth feel dry at other times of the day?
☐ Yes
☐ No
Do you keep a glass of water by your bed?
☐ Yes
☐ No
Do you sip liquids to aid in swallowing any food?
☐ Yes
☐ No</td><td>Does your mouth feel dry when eating a meal?
☐ Yes
☐ No
Do you chew gum daily to relieve oral dryness?
☐ Yes
☐ No
Do you use hard candies or mints daily to relieve oral dryness?
☐ Yes
☐ No
Does the amount of saliva in your mouth seem to be too little?
☐ Yes
☐ No</td></tr>
</table>

APPENDIX B

Oral examination form

1. Signs of dry mouth

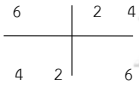
Frothy saliva ☐ Present ☐ Absent	Dryness of lips or buccal mucosa ☐ Present ☐ Absent
No saliva pooling in the floor of mouth ☐ Present ☐ Absent	Lobulated/deeply fissured tongue ☐ Present ☐ Absent
Sticking of mirror to the buccal mucosa or tongue ☐ Present ☐ Absent	Glassy appearance to the oral mucosa ☐ Present ☐ Absent

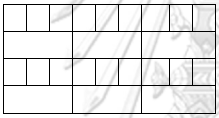
2. Salivary flow rate (ml/min)

Unstimulating saliva ..... ml/min ☐ more than 0.1 ☐ less than 0.1	Stimulating saliva ..... ml/min ☐ more than 0.7 ☐ less than 0.7

3 Gingival bleeding index

Gingival bleeding index

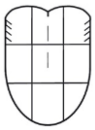




Gingival bleeding index (GI)
= (total score ÷ 24)

0 = absence of gingival inflammation
1 = mild inflammation: slight change in color, slight edema, no bleeding on probing
2 = moderate inflammation: redness, edema, glazing, bleeding on probing
3 = severe inflammation: marked redness and edema, ulceration, tendency toward spontaneous bleeding

4. Tongue coating index (%)



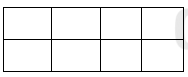
Tongue coating index (TCI)
= (total score ÷ 18) × 100

0 = Tongue coating not visible
1 = Tongue coating thin, papillae of tongue visible
2 = Tongue coating very thick, papillae of tongue not visible

5. Denture plaque index (%)

UPPER

Polishing surface



Tissue surface

Denture plaque index (DPI)
= (total score ÷ 32) × 100

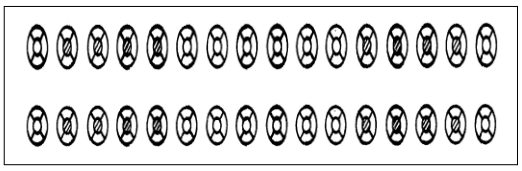
0 = No plaque
1 = Light plaque; 1% to 25% of area covered
2 = Moderate plaque; 26% to 50% of area covered
3 = Heavy plaque; 51% to 75% of area covered
4 = Very heavy plaque; 76% to 100% of area covered

6. Root caries index (%)

Root caries index (RCI)

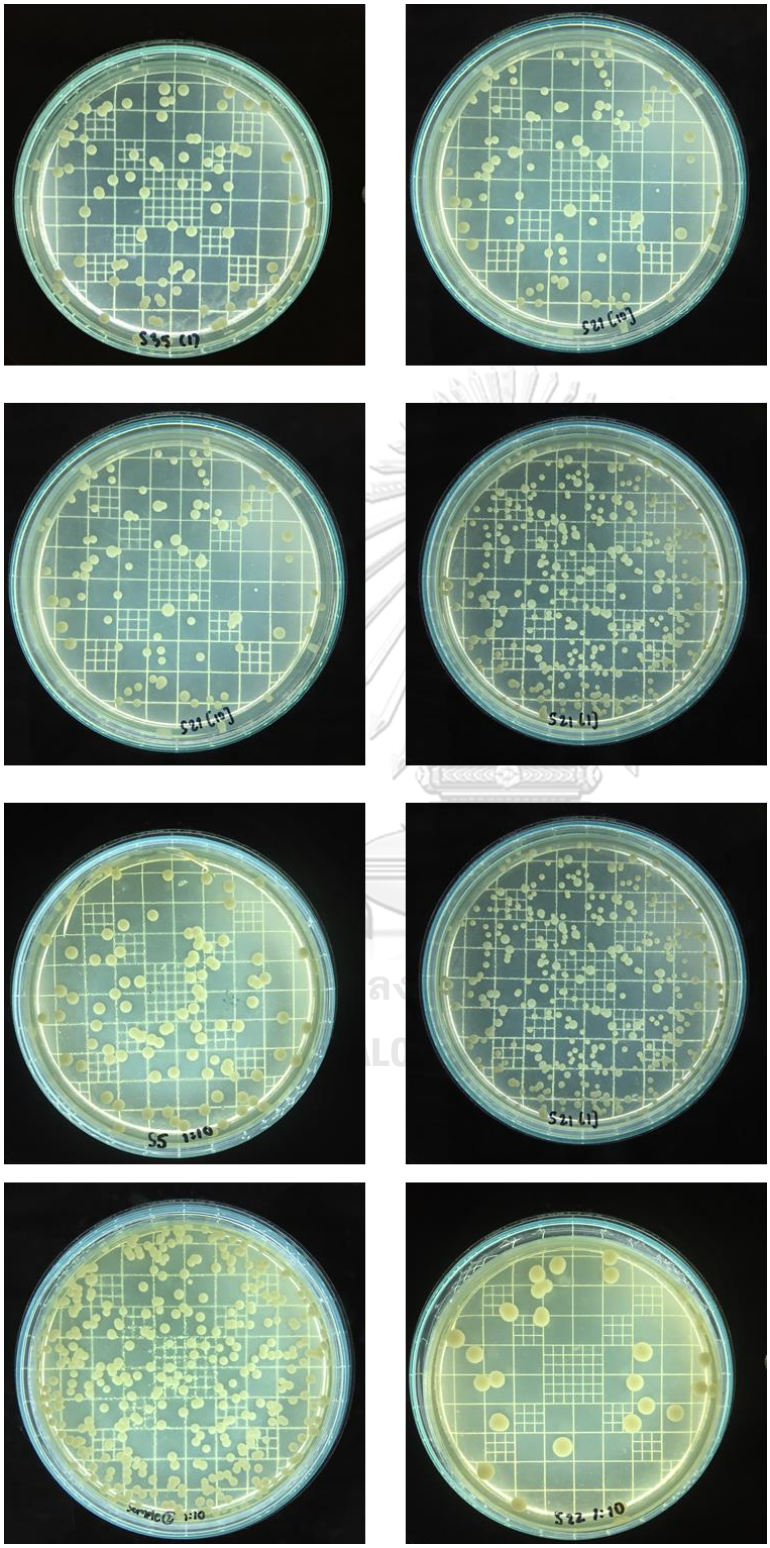
$= \{(R\text{-}D)+(R\text{-}F) \div (R\text{-}D)+(R\text{-}F)+(R\text{-}S)\} \times 100$

R-D = number of root surface with decay in recession tooth
R-F = number of root surface with permanent filling in recession tooth
R-S = number of sound root surface in recession tooth



APPENDIX C

Representative photographs of *Candida* colonies on YPD plates



APPENDIX D The Test of Normality

Tests of Normality

	Kolmogorov-Smirnov[a]			Shapiro-Wilk		
	Statistic	df	Sig.	Statistic	df	Sig.
age	.161	53	.001	.899	53	.000
logCFU	.344	53	.000	.770	53	.000
unstimflowrate	.156	53	.003	.870	53	.000
stimflowrate	.125	53	.039	.927	53	.003
GI	.272	53	.000	.784	53	.000
TCI	.219	53	.000	.871	53	.000
RCI	.076	53	.200*	.982	53	.597

*. This is a lower bound of the true significance.

a. Lilliefors Significance Correction

Tests of Normality

		Kolmogorov-Smirnov[a]			Shapiro-Wilk		
	flowrategroup	Statistic	df	Sig.	Statistic	df	Sig.
age	normal	.184	31	.009	.812	31	.000
	hypo	.187	22	.044	.901	22	.031
logCFU	normal	.426	31	.000	.645	31	.000
	hypo	.224	22	.005	.854	22	.004
unstimflowrate	normal	.147	31	.088	.904	31	.009
	hypo	.199	22	.024	.898	22	.027
stimflowrate	normal	.155	31	.057	.897	31	.006
	hypo	.288	22	.000	.884	22	.014
GI	normal	.379	31	.000	.646	31	.000
	hypo	.244	22	.001	.832	22	.002
TCI	normal	.242	31	.000	.850	31	.001
	hypo	.156	22	.179	.919	22	.072
RCI	normal	.099	31	.200*	.970	31	.524
	hypo	.095	22	.200*	.978	22	.890

*. This is a lower bound of the true significance.

a. Lilliefors Significance Correction

Tests of Normality

	agegroup	Kolmogorov-Smirnov[a] Statistic	df	Sig.	Shapiro-Wilk Statistic	df	Sig.
age	60-69	.217	25	.004	.829	25	.001
	70-79	.165	21	.139	.880	21	.014
	>80	.305	7	.047	.649	7	.001
logCFU	60-69	.378	25	.000	.734	25	.000
	70-79	.262	21	.001	.822	21	.001
	>80	.434	7	.000	.632	7	.001
unstimflowrate	60-69	.148	25	.165	.886	25	.009
	70-79	.209	21	.017	.846	21	.004
	>80	.304	7	.049	.789	7	.032
stimflowrate	60-69	.117	25	.200*	.968	25	.587
	70-79	.188	21	.051	.910	21	.056
	>80	.294	7	.068	.818	7	.061
GI	60-69	.277	25	.000	.725	25	.000
	70-79	.266	21	.000	.835	21	.002
	>80	.330	7	.021	.742	7	.010
TCI	60-69	.212	25	.005	.896	25	.015
	70-79	.203	21	.024	.857	21	.006
	>80	.383	7	.002	.606	7	.000
RCI	60-69	.102	25	.200*	.968	25	.604
	70-79	.141	21	.200*	.933	21	.161
	>80	.189	7	.200*	.938	7	.617

*. This is a lower bound of the true significance.

a. Lilliefors Significance Correction

Tests of Normality

	nounderlying	Kolmogorov-Smirnov[a] Statistic	df	Sig.	Shapiro-Wilk Statistic	df	Sig.
age	no	.168	34	.016	.895	34	.003
	yes	.157	19	.200*	.907	19	.064
logCFU	no	.328	34	.000	.780	34	.000
	yes	.371	19	.000	.721	19	.000
unstimflowrate	no	.194	34	.002	.819	34	.000
	yes	.195	19	.056	.912	19	.082
stimflowrate	no	.169	34	.015	.886	34	.002
	yes	.112	19	.200*	.950	19	.399
GI	no	.254	34	.000	.725	34	.000
	yes	.377	19	.000	.675	19	.000
TCI	no	.173	34	.012	.896	34	.004
	yes	.248	19	.003	.860	19	.010
RCI	no	.094	34	.200*	.967	34	.373
	yes	.115	19	.200*	.956	19	.494

*. This is a lower bound of the true significance.

a. Lilliefors Significance Correction

Tests of Normality

	sex	Kolmogorov-Smirnov[a] Statistic	df	Sig.	Shapiro-Wilk Statistic	df	Sig.
age	male	.210	8	.200*	.909	8	.344
	female	.166	45	.003	.900	45	.001
logCFU	male	.389	8	.001	.699	8	.002
	female	.334	45	.000	.777	45	.000
unstimflowrate	male	.164	8	.200*	.959	8	.799
	female	.181	45	.001	.848	45	.000
stimflowrate	male	.207	8	.200*	.906	8	.324
	female	.131	45	.050	.909	45	.002
GI	male	.274	8	.079	.696	8	.002
	female	.268	45	.000	.798	45	.000
TCI	male	.208	8	.200*	.926	8	.480
	female	.226	45	.000	.856	45	.000
RCI	male	.201	8	.200*	.921	8	.441
	female	.067	45	.200*	.971	45	.308

*. This is a lower bound of the true significance.

a. Lilliefors Significance Correction

Tests of Normality

	drymouthdruggroup	Kolmogorov-Smirnov[a] Statistic	df	Sig.	Shapiro-Wilk Statistic	df	Sig.
age	no	.172	17	.193	.874	17	.025
	yes	.153	36	.033	.898	36	.003
logCFU	no	.375	17	.000	.714	17	.000
	yes	.327	36	.000	.784	36	.000
unstimflowrate	no	.225	17	.022	.878	17	.030
	yes	.162	36	.018	.853	36	.000
stimflowrate	no	.138	17	.200*	.953	17	.497
	yes	.159	36	.021	.884	36	.001
GI	no	.381	17	.000	.668	17	.000
	yes	.246	36	.000	.790	36	.000
TCI	no	.181	17	.143	.884	17	.037
	yes	.146	36	.052	.919	36	.012
RCI	no	.110	17	.200*	.960	17	.638
	yes	.088	36	.200*	.975	36	.591

*. This is a lower bound of the true significance.

a. Lilliefors Significance Correction

Tests of Normality

	subdrymouthgroup	Kolmogorov-Smirnov[a] Statistic	df	Sig.	Shapiro-Wilk Statistic	df	Sig.
age	no	.122	15	.200*	.956	15	.626
	yes	.199	38	.001	.877	38	.001
logCFU	no	.417	15	.000	.653	15	.000
	yes	.314	38	.000	.791	38	.000
unstimflowrate	no	.201	15	.104	.900	15	.096
	yes	.183	38	.002	.830	38	.000
stimflowrate	no	.182	15	.197	.913	15	.148
	yes	.148	38	.036	.906	38	.004
GI	no	.255	15	.010	.888	15	.063
	yes	.285	38	.000	.739	38	.000
TCI	no	.233	15	.027	.777	15	.002
	yes	.211	38	.000	.889	38	.001
RCI	no	.139	15	.200*	.961	15	.702
	yes	.095	38	.200*	.984	38	.859

*. This is a lower bound of the true significance.

a. Lilliefors Significance Correction

Tests of Normality

		Kolmogorov-Smirnov[a]			Shapiro-Wilk		
	dentureusegroup	Statistic	df	Sig.	Statistic	df	Sig.
age	no	.191	42	.001	.896	42	.001
	yes	.153	11	.200*	.898	11	.175
logCFU	no	.381	42	.000	.725	42	.000
	yes	.202	11	.200*	.845	11	.036
unstimflowrate	no	.141	42	.036	.877	42	.000
	yes	.271	11	.023	.802	11	.010
stimflowrate	no	.142	42	.033	.932	42	.015
	yes	.212	11	.181	.882	11	.110
GI	no	.269	42	.000	.806	42	.000
	yes	.253	11	.048	.832	11	.025
TCI	no	.248	42	.000	.845	42	.000
	yes	.180	11	.200*	.945	11	.576
RCI	no	.105	42	.200*	.972	42	.398
	yes	.158	11	.200*	.948	11	.625

*. This is a lower bound of the true significance.

a. Lilliefors Significance Correction

Tests of Normality

		Kolmogorov-Smirnov[a]			Shapiro-Wilk		
	subdrymouthgroup	Statistic	df	Sig.	Statistic	df	Sig.
age	no	.122	15	.200*	.956	15	.626
	yes	.199	38	.001	.877	38	.001
logCFU	no	.417	15	.000	.653	15	.000
	yes	.314	38	.000	.791	38	.000
unstimflowrate	no	.201	15	.104	.900	15	.096
	yes	.183	38	.002	.830	38	.000
stimflowrate	no	.182	15	.197	.913	15	.148
	yes	.148	38	.036	.906	38	.004
GI	no	.255	15	.010	.888	15	.063
	yes	.285	38	.000	.739	38	.000
TCI	no	.233	15	.027	.777	15	.002
	yes	.211	38	.000	.889	38	.001
RCI	no	.139	15	.200*	.961	15	.702
	yes	.095	38	.200*	.984	38	.859

*. This is a lower bound of the true significance.

a. Lilliefors Significance Correction

Tests of Normality

		Kolmogorov-Smirnov[a]			Shapiro-Wilk		
	objdrymouthgroup	Statistic	df	Sig.	Statistic	df	Sig.
age	no	.115	34	.200*	.922	34	.019
	yes	.244	19	.004	.841	19	.005
logCFU	no	.409	34	.000	.677	34	.000
	yes	.224	19	.013	.846	19	.006
unstimflowrate	no	.127	34	.177	.945	34	.088
	yes	.325	19	.000	.558	19	.000
stimflowrate	no	.100	34	.200*	.964	34	.309
	yes	.229	19	.010	.687	19	.000
GI	no	.316	34	.000	.818	34	.000
	yes	.345	19	.000	.674	19	.000
TCI	no	.254	34	.000	.823	34	.000
	yes	.199	19	.047	.908	19	.067
RCI	no	.114	34	.200*	.967	34	.374
	yes	.153	19	.200*	.951	19	.406

*. This is a lower bound of the true significance.

a. Lilliefors Significance Correction

Tests of Normality[b]

		Kolmogorov-Smirnov[a]			Shapiro-Wilk		
	candidaspp	Statistic	df	Sig.	Statistic	df	Sig.
age	no	.184	28	.016	.867	28	.002
	yes	.154	25	.128	.881	25	.007
logCFU	yes	.135	25	.200*	.902	25	.020
unstimflowrate	no	.152	28	.094	.911	28	.021
	yes	.191	25	.019	.798	25	.000
stimflowrate	no	.110	28	.200*	.929	28	.058
	yes	.180	25	.036	.856	25	.002
GI	no	.336	28	.000	.799	28	.000
	yes	.312	25	.000	.719	25	.000
TCI	no	.243	28	.000	.848	28	.001
	yes	.204	25	.009	.896	25	.015
RCI	no	.090	28	.200*	.975	28	.713
	yes	.108	25	.200*	.966	25	.539

*. This is a lower bound of the true significance.

a. Lilliefors Significance Correction

b. logCFU is constant when candidaspp = no. It has been omitted.

Tests of Normality

	multiplespecies	Kolmogorov-Smirnov[a] Statistic	df	Sig.	Shapiro-Wilk Statistic	df	Sig.
age	no	.162	44	.005	.897	44	.001
	yes	.236	9	.161	.915	9	.351
logCFU	no	.403	44	.000	.695	44	.000
	yes	.213	9	.200*	.904	9	.273
unstimflowrate	no	.152	44	.012	.881	44	.000
	yes	.278	9	.043	.776	9	.011
stimflowrate	no	.120	44	.116	.928	44	.009
	yes	.240	9	.144	.821	9	.036
GI	no	.271	44	.000	.792	44	.000
	yes	.283	9	.036	.700	9	.001
TCI	no	.231	44	.000	.861	44	.000
	yes	.264	9	.071	.899	9	.245
RCI	no	.090	44	.200*	.976	44	.478
	yes	.204	9	.200*	.901	9	.257

*. This is a lower bound of the true significance.

a. Lilliefors Significance Correction

Tests of Normality

	nonalbicans	Kolmogorov-Smirnov[a] Statistic	df	Sig.	Shapiro-Wilk Statistic	df	Sig.
age	no	.172	40	.004	.895	40	.001
	yes	.230	13	.058	.888	13	.092
logCFU	no	.436	40	.000	.641	40	.000
	yes	.204	13	.143	.865	13	.044
unstimflowrate	no	.134	40	.068	.888	40	.001
	yes	.240	13	.038	.781	13	.004
stimflowrate	no	.123	40	.133	.926	40	.012
	yes	.183	13	.200*	.880	13	.071
GI	no	.293	40	.000	.824	40	.000
	yes	.350	13	.000	.694	13	.000
TCI	no	.233	40	.000	.856	40	.000
	yes	.215	13	.104	.891	13	.101
RCI	no	.094	40	.200*	.973	40	.437
	yes	.200	13	.160	.925	13	.291

*. This is a lower bound of the true significance.

a. Lilliefors Significance Correction

Tests of Normality

	C.albican	Kolmogorov-Smirnov[a] Statistic	df	Sig.	Shapiro-Wilk Statistic	df	Sig.
age	no	.191	34	.003	.885	34	.002
	yes	.152	19	.200*	.882	19	.023
logCFU	no	.494	34	.000	.498	34	.000
	yes	.165	19	.187	.918	19	.104
unstimflowrate	no	.163	34	.023	.898	34	.004
	yes	.154	19	.200*	.809	19	.002
stimflowrate	no	.095	34	.200*	.946	34	.090
	yes	.214	19	.022	.815	19	.002
GI	no	.277	34	.000	.804	34	.000
	yes	.244	19	.004	.742	19	.000
TCI	no	.237	34	.000	.854	34	.000
	yes	.233	19	.008	.897	19	.044
RCI	no	.089	34	.200*	.981	34	.795
	yes	.091	19	.200*	.966	19	.703

*. This is a lower bound of the true significance.

a. Lilliefors Significance Correction

Tests of Normality

	C.parasilosis	Kolmogorov-Smirnov[a] Statistic	df	Sig.	Shapiro-Wilk Statistic	df	Sig.
age	no	.152	49	.006	.895	49	.000
	yes	.263	4	.	.909	4	.479
logCFU	no	.368	49	.000	.737	49	.000
	yes	.345	4	.	.780	4	.072
unstimflowrate	no	.169	49	.001	.871	49	.000
	yes	.215	4	.	.946	4	.689
stimflowrate	no	.126	49	.048	.935	49	.009
	yes	.250	4	.	.945	4	.683
GI	no	.268	49	.000	.793	49	.000
	yes	.242	4	.	.923	4	.551
TCI	no	.221	49	.000	.867	49	.000
	yes	.262	4	.	.895	4	.408
RCI	no	.073	49	.200*	.977	49	.457
	yes	.172	4	.	.993	4	.971

*. This is a lower bound of the true significance.

a. Lilliefors Significance Correction

Tests of Normality

		Kolmogorov-Smirnov[a]			Shapiro-Wilk		
	C.dubliniensis	Statistic	df	Sig.	Statistic	df	Sig.
age	no	.147	49	.010	.902	49	.001
	yes	.333	4	.	.828	4	.163
logCFU	no	.367	49	.000	.741	49	.000
	yes	.388	4	.	.730	4	.025
unstimflowrate	no	.159	49	.003	.880	49	.000
	yes	.192	4	.	.971	4	.850
stimflowrate	no	.126	49	.050	.921	49	.003
	yes	.263	4	.	.883	4	.350
GI	no	.290	49	.000	.819	49	.000
	yes	.260	4	.	.870	4	.296
TCI	no	.213	49	.000	.869	49	.000
	yes	.274	4	.	.864	4	.275
RCI	no	.072	49	.200*	.979	49	.511
	yes	.367	4	.	.767	4	.055

*. This is a lower bound of the true significance.

a. Lilliefors Significance Correction

Tests of Normality

		Kolmogorov-Smirnov[a]			Shapiro-Wilk		
	C.glabata	Statistic	df	Sig.	Statistic	df	Sig.
age	no	.165	48	.002	.892	48	.000
	yes	.231	5	.200*	.943	5	.685
logCFU	no	.373	48	.000	.739	48	.000
	yes	.240	5	.200*	.955	5	.770
unstimflowrate	no	.150	48	.009	.869	48	.000
	yes	.339	5	.061	.828	5	.135
stimflowrate	no	.134	48	.031	.922	48	.003
	yes	.191	5	.200*	.978	5	.926
GI	no	.287	48	.000	.757	48	.000
	yes	.281	5	.200*	.928	5	.584
TCI	no	.232	48	.000	.864	48	.000
	yes	.253	5	.200*	.924	5	.559
RCI	no	.091	48	.200*	.979	48	.530
	yes	.256	5	.200*	.832	5	.145

*. This is a lower bound of the true significance.

a. Lilliefors Significance Correction

Tests of Normality[b,c,d,e,f,g,i]

	C.tropical	Kolmogorov-Smirnov[a] Statistic	df	Sig.	Shapiro-Wilk Statistic	df	Sig.
age	no	.168	52	.001	.895	52	.000
logCFU	no	.349	52	.000	.765	52	.000
unstimflowrate	no	.154	52	.004	.873	52	.000
stimflowrate	no	.118	52	.067	.926	52	.003
GI	no	.271	52	.000	.788	52	.000
TCI	no	.229	52	.000	.868	52	.000
RCI	no	.070	52	.200*	.983	52	.648

*. This is a lower bound of the true significance.

a. Lilliefors Significance Correction

b. age is constant when C.tropical = yes. It has been omitted.

c. logCFU is constant when C.tropical = yes. It has been omitted.

d. unstimflowrate is constant when C.tropical = yes. It has been omitted.

e. stimflowrate is constant when C.tropical = yes. It has been omitted.

f. GI is constant when C.tropical = yes. It has been omitted.

g. TCI is constant when C.tropical = yes. It has been omitted.

i. RCI is constant when C.tropical = yes. It has been omitted.

Tests of Normality

	C.krusei	Kolmogorov-Smirnov[a] Statistic	df	Sig.	Shapiro-Wilk Statistic	df	Sig.
age	no	.164	51	.001	.897	51	.000
	yes	.260	2	.			
logCFU	no	.354	51	.000	.759	51	.000
	yes	.260	2	.			
unstimflowrate	no	.147	51	.008	.877	51	.000
	yes	.260	2	.			
stimflowrate	no	.116	51	.085	.924	51	.003
	yes	.260	2	.			
GI	no	.269	51	.000	.793	51	.000
	yes	.260	2	.			
TCI	no	.222	51	.000	.870	51	.000
	yes	.260	2	.			
RCI	no	.068	51	.200*	.983	51	.664
	yes	.260	2	.			

*. This is a lower bound of the true significance.

a. Lilliefors Significance Correction

APPENDIX E. The Independent T-test

Association of clinical parameters and oral health indices

Group Statistics

	flowrategroup	N	Mean	Std. Deviation	Std. Error Mean
RCI	normal	31	10.2784	5.97775	1.07363
	hypo	22	10.3055	5.02121	1.07052

Independent Samples Test

		Levene's Test for Equality of Variances		t-test for Equality of Means						
									95% Confidence Interval of the Difference	
		F	Sig.	t	df	Sig. (2-tailed)	Mean Difference	Std. Error Difference	Lower	Upper
RCI	Equal variances assumed	.821	.369	-.017	51	.986	-.02707	1.56214	-3.16319	3.10906
	Equal variances not assumed			-.018	49.462	.986	-.02707	1.51615	-3.07317	3.01903

Group Statistics

	subdrymouthgroup	N	Mean	Std. Deviation	Std. Error Mean
RCI	no	15	9.0560	5.76376	1.48820
	yes	38	10.7766	5.46375	.88634

Independent Samples Test

		Levene's Test for Equality of Variances		t-test for Equality of Means						
									95% Confidence Interval of the Difference	
		F	Sig.	t	df	Sig. (2-tailed)	Mean Difference	Std. Error Difference	Lower	Upper
RCI	Equal variances assumed	.065	.799	-1.017	51	.314	-1.72058	1.69167	-5.11674	1.67559
	Equal variances not assumed			-.993	24.526	.330	-1.72058	1.73214	-5.29150	1.85034

Group Statistics

	objdrymouthgroup	N	Mean	Std. Deviation	Std. Error Mean
RCI	no	34	10.6668	6.06317	1.03983
	yes	19	9.6147	4.56337	1.04691

Independent Samples Test

		Levene's Test for Equality of Variances		t-test for Equality of Means						
									95% Confidence Interval of the Difference	
		F	Sig.	t	df	Sig. (2-tailed)	Mean Difference	Std. Error Difference	Lower	Upper
RCI	Equal variances assumed	3.265	.077	.658	51	.513	1.05203	1.59831	-2.15670	4.26076
	Equal variances not assumed			.713	46.401	.479	1.05203	1.47555	-1.91741	4.02147

Group Statistics

	brushaftermealgroup	N	Mean	Std. Deviation	Std. Error Mean
RCI	no	28	10.0300	4.50576	.85151
	yes	25	10.5804	6.61225	1.32245

Independent Samples Test

		Levene's Test for Equality of Variances		t-test for Equality of Means						
									95% Confidence Interval of the Difference	
		F	Sig.	t	df	Sig. (2-tailed)	Mean Difference	Std. Error Difference	Lower	Upper
RCI	Equal variances assumed	3.429	.070	-.357	51	.722	-.55040	1.54000	-3.64208	2.54128
	Equal variances not assumed			-.350	41.660	.728	-.55040	1.57288	-3.72536	2.62456

Group Statistics

	dentureusegroup	N	Mean	Std. Deviation	Std. Error Mean
RCI	no	42	9.4924	5.35509	.82631
	yes	11	13.3336	5.45066	1.64344

Independent Samples Test

		Levene's Test for Equality of Variances		t-test for Equality of Means						
									95% Confidence Interval of the Difference	
		F	Sig.	t	df	Sig. (2-tailed)	Mean Difference	Std. Error Difference	Lower	Upper
RCI	Equal variances assumed	.159	.692	-2.110	51	.040	-3.84126	1.82017	-7.49540	-.18711
	Equal variances not assumed			-2.088	15.454	.054	-3.84126	1.83948	-7.75199	.06948

Group Statistics

	candidaspp	N	Mean	Std. Deviation	Std. Error Mean
RCI	no	28	10.0950	5.82387	1.10061
	yes	25	10.5076	5.33641	1.06728

Independent Samples Test

		Levene's Test for Equality of Variances		t-test for Equality of Means						
									95% Confidence Interval of the Difference	
		F	Sig.	t	df	Sig. (2-tailed)	Mean Difference	Std. Error Difference	Lower	Upper
RCI	Equal variances assumed	.544	.464	-.268	51	.790	-.41260	1.54084	-3.50598	2.68078
	Equal variances not assumed			-.269	50.960	.789	-.41260	1.53311	-3.49051	2.66531

Group Statistics

	nonalbicans	N	Mean	Std. Deviation	Std. Error Mean
RCI	no	40	9.7113	5.56482	.87988
	yes	13	12.0692	5.31664	1.47457

Independent Samples Test

		Levene's Test for Equality of Variances		t-test for Equality of Means						
									95% Confidence Interval of the Difference	
		F	Sig.	t	df	Sig. (2-tailed)	Mean Difference	Std. Error Difference	Lower	Upper
RCI	Equal variances assumed	.312	.579	-1.341	51	.186	-2.35798	1.75827	-5.88786	1.17189
	Equal variances not assumed			-1.373	21.238	.184	-2.35798	1.71713	-5.92652	1.21056

Group Statistics

	multiplespecies	N	Mean	Std. Deviation	Std. Error Mean
RCI	no	44	9.7243	5.40385	.81466
	yes	9	13.0533	5.73372	1.91124

Independent Samples Test

		Levene's Test for Equality of Variances		t-test for Equality of Means						
									95% Confidence Interval of the Difference	
		F	Sig.	t	df	Sig. (2-tailed)	Mean Difference	Std. Error Difference	Lower	Upper
RCI	Equal variances assumed	.002	.967	-1.668	51	.102	-3.32902	1.99635	-7.33686	.67883
	Equal variances not assumed			-1.602	11.103	.137	-3.32902	2.07762	-7.89666	1.23863

APPENDIX D The Mann-Whitney U test

Association of population characteristics and salivary flow rate

Test Statistics[a]

	age	unstimflowrate	stimflowrate
Mann-Whitney U	196.000	95.000	5.000
Wilcoxon W	692.000	348.000	258.000
Z	-2.628	-4.455	-6.085
Asymp. Sig. (2-tailed)	.009	.000	.000

a. Grouping Variable: flowrategroup

Test Statistics[a]

	unstimflowrate	stimflowrate
Mann-Whitney U	174.500	135.000
Wilcoxon W	1209.500	1170.000
Z	-.137	-1.122
Asymp. Sig. (2-tailed)	.891	.262
Exact Sig. [2*(1-tailed Sig.)]	.893[b]	.275[b]

a. Grouping Variable: sex

b. Not corrected for ties.

Test Statistics[a]

	unstimflowrate	stimflowrate
Mann-Whitney U	269.500	205.000
Wilcoxon W	935.500	871.000
Z	-.698	-1.931
Asymp. Sig. (2-tailed)	.485	.053

a. Grouping Variable: drymouthdruggroup

Test Statistics[a]

	unstimflowrate	stimflowrate
Mann-Whitney U	206.000	218.500
Wilcoxon W	947.000	959.500
Z	-1.565	-1.317
Asymp. Sig. (2-tailed)	.118	.188

a. Grouping Variable: subdrymouthgroup

Test Statistics[a]

	unstimflowrate	stimflowrate
Mann-Whitney U	166.000	163.500
Wilcoxon W	356.000	353.500
Z	-2.922	-2.968
Asymp. Sig. (2-tailed)	.003	.003

a. Grouping Variable: objdrymouthgroup

Test Statistics[a]

	unstimflowrate	stimflowrate
Mann-Whitney U	209.000	231.000
Wilcoxon W	1112.000	297.000
Z	-.484	.000
Asymp. Sig. (2-tailed)	.628	1.000

a. Grouping Variable: dentureusegroup

Test Statistics[a]

	unstimflowrate	stimflowrate
Mann-Whitney U	236.500	198.000
Wilcoxon W	561.500	523.000
Z	-2.029	-2.717
Asymp. Sig. (2-tailed)	.042	.007

a. Grouping Variable: candidaspp

Test Statistics[a]

	unstimflowrate	stimflowrate
Mann-Whitney U	226.500	175.000
Wilcoxon W	317.500	266.000
Z	-.695	-1.763
Asymp. Sig. (2-tailed)	.487	.078

a. Grouping Variable: nonalbicans

Test Statistics[a]

	unstimflowrate	stimflowrate
Mann-Whitney U	184.000	122.500
Wilcoxon W	229.000	167.500
Z	-.333	-1.794
Asymp. Sig. (2-tailed)	.739	.073
Exact Sig. [2*(1-tailed Sig.)]	.753[b]	.073[b]

a. Grouping Variable: multiplespecies

b. Not corrected for ties.

Association of clinical parameters and oral health indices

Test Statistics[a]

	GI	TCI
Mann-Whitney U	179.000	207.500
Wilcoxon W	675.000	703.500
Z	-2.971	-2.433
Asymp. Sig. (2-tailed)	.003	.015

a. Grouping Variable: flowrategroup

Test Statistics[a]

	GI	TCI
Mann-Whitney U	247.500	201.500
Wilcoxon W	367.500	321.500
Z	-.752	-1.665
Asymp. Sig. (2-tailed)	.452	.096

a. Grouping Variable: subdrymouthgroup

Test Statistics[a]

	GI	TCI
Mann-Whitney U	189.000	268.500
Wilcoxon W	784.000	863.500
Z	-2.525	-1.021
Asymp. Sig. (2-tailed)	.012	.307

a. Grouping Variable: objdrymouthgroup

Test Statistics[a]

	GI	TCI
Mann-Whitney U	330.500	323.500
Wilcoxon W	655.500	729.500
Z	-.353	-.477
Asymp. Sig. (2-tailed)	.724	.634

a. Grouping Variable: brushaftermealgroup

Test Statistics[a]

	GI	TCI
Mann-Whitney U	221.500	184.000
Wilcoxon W	287.500	1087.000
Z	-.212	-1.041
Asymp. Sig. (2-tailed)	.832	.298

a. Grouping Variable: dentureusegroup

Test Statistics[a]

	GI	TCI
Mann-Whitney U	274.000	293.000
Wilcoxon W	680.000	699.000
Z	-1.376	-1.025
Asymp. Sig. (2-tailed)	.169	.305

a. Grouping Variable: candidaspp

Test Statistics[a]

	GI	TCI
Mann-Whitney U	210.000	225.500
Wilcoxon W	1030.000	1045.500
Z	-1.050	-.720
Asymp. Sig. (2-tailed)	.294	.471

a. Grouping Variable: nonalbicans

Test Statistics[a]

	GI	TCI
Mann-Whitney U	165.000	171.500
Wilcoxon W	1155.000	1161.500
Z	-.794	-.634
Asymp. Sig. (2-tailed)	.427	.526
Exact Sig. [2*(1-tailed Sig.)]	.448[b]	.536[b]

a. Grouping Variable: multiplespecies

b. Not corrected for ties.

Association of clinical parameters and quantity of Candida colonization

Test Statistics[a]

	logCFU
Mann-Whitney U	17.000
Wilcoxon W	23.000
Z	-1.339
Asymp. Sig. (2-tailed)	.181
Exact Sig. [2*(1-tailed Sig.)]	.206[b]

a. Grouping Variable: sex

b. Not corrected for ties.

Test Statistics[a]

	logCFU
Mann-Whitney U	40.500
Wilcoxon W	68.500
Z	-1.362
Asymp. Sig. (2-tailed)	.173
Exact Sig. [2*(1-tailed Sig.)]	.178[b]

a. Grouping Variable: drymouthdruggroup

b. Not corrected for ties.

Test Statistics[a]

	logCFU
Mann-Whitney U	17.000
Wilcoxon W	32.000
Z	-2.243
Asymp. Sig. (2-tailed)	.025
Exact Sig. [2*(1-tailed Sig.)]	.024[b]

a. Grouping Variable: subdrymouthgroup

b. Not corrected for ties.

Test Statistics[a]

	logCFU
Mann-Whitney U	53.500
Wilcoxon W	131.500
Z	-1.333
Asymp. Sig. (2-tailed)	.182
Exact Sig. [2*(1-tailed Sig.)]	.186[b]

a. Grouping Variable: objdrymouthgroup

b. Not corrected for ties.

Test Statistics[a]

	logCFU
Mann-Whitney U	58.500
Wilcoxon W	113.500
Z	-.916
Asymp. Sig. (2-tailed)	.360
Exact Sig. [2*(1-tailed Sig.)]	.367[b]

a. Grouping Variable: flowrategroup

b. Not corrected for ties.

Test Statistics[a]

	logCFU
Mann-Whitney U	39.000
Wilcoxon W	192.000
Z	-1.690
Asymp. Sig. (2-tailed)	.091
Exact Sig. [2*(1-tailed Sig.)]	.097[b]

a. Grouping Variable: dentureusegroup

b. Not corrected for ties.

Test Statistics[a]

	logCFU
Mann-Whitney U	49.000
Wilcoxon W	115.000
Z	-1.533
Asymp. Sig. (2-tailed)	.125
Exact Sig. [2*(1-tailed Sig.)]	.134[b]

a. Grouping Variable: brushaftermealgroup

b. Not corrected for ties.

Test Statistics[a]

	logCFU
Mann-Whitney U	39.500
Wilcoxon W	60.500
Z	-1.114
Asymp. Sig. (2-tailed)	.265
Exact Sig. [2*(1-tailed Sig.)]	.274[b]

a. Grouping Variable: C.albican

b. Not corrected for ties.

Test Statistics[a]

	logCFU
Mann-Whitney U	65.000
Wilcoxon W	156.000
Z	-.707
Asymp. Sig. (2-tailed)	.479
Exact Sig. [2*(1-tailed Sig.)]	.503[b]

a. Grouping Variable: nonalbicans

b. Not corrected for ties.

Test Statistics[a]

	logCFU
Mann-Whitney U	66.000
Wilcoxon W	202.000
Z	-.340
Asymp. Sig. (2-tailed)	.734
Exact Sig. [2*(1-tailed Sig.)]	.760[b]

a. Grouping Variable: multiplespecies

b. Not corrected for ties.

APPENDIX E The Pearson Chi-Square test and Fisher's Exact Test

Characteristics of the study population

sex * flowrategroup Crosstabulation

Count

		flowrategroup		
		normal	hypo	Total
sex	male	5	3	8
	female	26	19	45
Total		31	22	53

Chi-Square Tests

	Value	df	Asymptotic Significance (2-sided)	Exact Sig. (2-sided)	Exact Sig. (1-sided)	Point Probability
Pearson Chi-Square	.062[a]	1	.803	1.000	.561	
Continuity Correction[b]	.000	1	1.000			
Likelihood Ratio	.063	1	.802	1.000	.561	
Fisher's Exact Test				1.000	.561	
Linear-by-Linear Association	.061[c]	1	.805	1.000	.561	.295
N of Valid Cases	53					

a. 2 cells (50.0%) have expected count less than 5. The minimum expected count is 3.32.

b. Computed only for a 2x2 table

c. The standardized statistic is .247.

Characteristics of the study population

drymouthdruggroup * flowrategroup Crosstabulation

Count

		flowrategroup		
		normal	hypo	Total
drymouthdruggroup	no	13	4	17
	yes	18	18	36
Total		31	22	53

Chi-Square Tests

	Value	df	Asymptotic Significance (2-sided)	Exact Sig. (2-sided)	Exact Sig. (1-sided)	Point Probability
Pearson Chi-Square	3.332[a]	1	.068	.082	.062	
Continuity Correction[b]	2.331	1	.127			
Likelihood Ratio	3.481	1	.062	.082	.062	
Fisher's Exact Test				.082	.062	
Linear-by-Linear Association	3.270[c]	1	.071	.082	.062	.047
N of Valid Cases	53					

a. 0 cells (0.0%) have expected count less than 5. The minimum expected count is 7.06.

b. Computed only for a 2x2 table

c. The standardized statistic is 1.808.

Characteristics of the study population

brushaftermealgroup * flowrategroup Crosstabulation

Count

		flowrategroup		
		normal	hypo	Total
brushaftermealgroup	no	18	10	28
	yes	13	12	25
Total		31	22	53

Chi-Square Tests

	Value	df	Asymptotic Significance (2-sided)	Exact Sig. (2-sided)	Exact Sig. (1-sided)	Point Probability
Pearson Chi-Square	.821[a]	1	.365	.413	.265	
Continuity Correction[b]	.393	1	.531			
Likelihood Ratio	.822	1	.365	.413	.265	
Fisher's Exact Test				.413	.265	
Linear-by-Linear Association	.806[c]	1	.369	.413	.265	.148
N of Valid Cases	53					

a. 0 cells (0.0%) have expected count less than 5. The minimum expected count is 10.38.

b. Computed only for a 2x2 table

c. The standardized statistic is .898.

Characteristics of the study population

dentureusegroup * flowrategroup Crosstabulation

Count

		flowrategroup		
		normal	hypo	Total
dentureusegroup	no	24	18	42
	yes	7	4	11
Total		31	22	53

Chi-Square Tests

	Value	df	Asymptotic Significance (2-sided)	Exact Sig. (2-sided)	Exact Sig. (1-sided)	Point Probability
Pearson Chi-Square	.151[a]	1	.697	.746	.487	
Continuity Correction[b]	.002	1	.964			
Likelihood Ratio	.153	1	.696	.746	.487	
Fisher's Exact Test				.746	.487	
Linear-by-Linear Association	.149[c]	1	.700	.746	.487	.252
N of Valid Cases	53					

a. 1 cells (25.0%) have expected count less than 5. The minimum expected count is 4.57.

b. Computed only for a 2x2 table

c. The standardized statistic is -.385.

Characteristics of the study population

subdrymouthgroup * flowrategroup Crosstabulation

Count

		flowrategroup		
		normal	hypo	Total
subdrymouthgroup	no	10	5	15
	yes	21	17	38
Total		31	22	53

Chi-Square Tests

	Value	df	Asymptotic Significance (2-sided)	Exact Sig. (2-sided)	Exact Sig. (1-sided)	Point Probability
Pearson Chi-Square	.576[a]	1	.448	.544	.329	
Continuity Correction[b]	.202	1	.653			
Likelihood Ratio	.585	1	.444	.544	.329	
Fisher's Exact Test				.544	.329	
Linear-by-Linear Association	.565[c]	1	.452	.544	.329	.187
N of Valid Cases	53					

a. 0 cells (0.0%) have expected count less than 5. The minimum expected count is 6.23.

b. Computed only for a 2x2 table

c. The standardized statistic is .752.

Characteristics of the study population

objdrymouthgroup * flowrategroup Crosstabulation

Count

		flowrategroup		
		normal	hypo	Total
objdrymouthgroup	no	25	9	34
	yes	6	13	19
Total		31	22	53

Chi-Square Tests

	Value	df	Asymptotic Significance (2-sided)	Exact Sig. (2-sided)	Exact Sig. (1-sided)	Point Probability
Pearson Chi-Square	8.835[a]	1	.003	.004	.004	
Continuity Correction[b]	7.191	1	.007			
Likelihood Ratio	8.940	1	.003	.004	.004	
Fisher's Exact Test				.004	.004	
Linear-by-Linear Association	8.668[c]	1	.003	.004	.004	.003
N of Valid Cases	53					

a. 0 cells (0.0%) have expected count less than 5. The minimum expected count is 7.89.

b. Computed only for a 2x2 table

c. The standardized statistic is 2.944.

Characteristics of the study population

Crosstab

Count

		flowrategroup		
		normal	hypo	Total
cardiovascular	no	20	11	31
	yes	11	11	22
Total		31	22	53

Chi-Square Tests

	Value	df	Asymptotic Significance (2-sided)	Exact Sig. (2-sided)	Exact Sig. (1-sided)	Point Probability
Pearson Chi-Square	1.117[a]	1	.291	.398	.219	
Continuity Correction[b]	.599	1	.439			
Likelihood Ratio	1.115	1	.291	.398	.219	
Fisher's Exact Test				.398	.219	
Linear-by-Linear Association	1.096[c]	1	.295	.398	.219	.129
N of Valid Cases	53					

a. 0 cells (0.0%) have expected count less than 5. The minimum expected count is 9.13.

b. Computed only for a 2x2 table

c. The standardized statistic is 1.047.

Characteristics of the study population

Crosstab

Count

		flowrategroup		
		normal	hypo	Total
CKD	no	29	19	48
	yes	2	3	5
Total		31	22	53

Chi-Square Tests

	Value	df	Asymptotic Significance (2-sided)	Exact Sig. (2-sided)	Exact Sig. (1-sided)	Point Probability
Pearson Chi-Square	.777[a]	1	.378	.638	.338	
Continuity Correction[b]	.164	1	.686			
Likelihood Ratio	.764	1	.382	.638	.338	
Fisher's Exact Test				.638	.338	
Linear-by-Linear Association	.763[c]	1	.382	.638	.338	.250
N of Valid Cases	53					

a. 2 cells (50.0%) have expected count less than 5. The minimum expected count is 2.08.

b. Computed only for a 2x2 table

c. The standardized statistic is .873.

Characteristics of the study population

Crosstab

Count

		flowrategroup		
		normal	hypo	Total
osteoporosis	no	28	22	50
	yes	3	0	3
Total		31	22	53

Chi-Square Tests

	Value	df	Asymptotic Significance (2-sided)	Exact Sig. (2-sided)	Exact Sig. (1-sided)	Point Probability
Pearson Chi-Square	2.257[a]	1	.133	.258	.192	
Continuity Correction[b]	.808	1	.369			
Likelihood Ratio	3.345	1	.067	.258	.192	
Fisher's Exact Test				.258	.192	
Linear-by-Linear Association	2.214[c]	1	.137	.258	.192	.192
N of Valid Cases	53					

a. 2 cells (50.0%) have expected count less than 5. The minimum expected count is 1.25.

b. Computed only for a 2x2 table

c. The standardized statistic is -1.488.

Characteristics of the study population

Crosstab

Count

		flowrategroup		
		normal	hypo	Total
depressive	no	30	20	50
	yes	1	2	3
Total		31	22	53

Chi-Square Tests

	Value	df	Asymptotic Significance (2-sided)	Exact Sig. (2-sided)	Exact Sig. (1-sided)	Point Probability
Pearson Chi-Square	.829[a]	1	.363	.563	.371	
Continuity Correction[b]	.094	1	.759			
Likelihood Ratio	.818	1	.366	.563	.371	
Fisher's Exact Test				.563	.371	
Linear-by-Linear Association	.813[c]	1	.367	.563	.371	.306
N of Valid Cases	53					

a. 2 cells (50.0%) have expected count less than 5. The minimum expected count is 1.25.

b. Computed only for a 2x2 table

c. The standardized statistic is .902.

Characteristics of the study population

Crosstab

Count

		flowrategroup		
		normal	hypo	Total
DM	no	28	21	49
	yes	3	1	4
Total		31	22	53

Chi-Square Tests

	Value	df	Asymptotic Significance (2-sided)	Exact Sig. (2-sided)	Exact Sig. (1-sided)	Point Probability
Pearson Chi-Square	.486[a]	1	.486	.633	.445	
Continuity Correction[b]	.029	1	.866			
Likelihood Ratio	.514	1	.473	.633	.445	
Fisher's Exact Test				.633	.445	
Linear-by-Linear Association	.477[c]	1	.490	.633	.445	.338
N of Valid Cases	53					

a. 2 cells (50.0%) have expected count less than 5. The minimum expected count is 1.66.

b. Computed only for a 2x2 table

c. The standardized statistic is -.690.

Characteristics of the study population

Crosstab

Count

		flowrategroup		
		normal	hypo	Total
cerebrovascular	no	31	20	51
	yes	0	2	2
Total		31	22	53

Chi-Square Tests

	Value	df	Asymptotic Significance (2-sided)	Exact Sig. (2-sided)	Exact Sig. (1-sided)	Point Probability
Pearson Chi-Square	2.929[a]	1	.087	.168	.168	
Continuity Correction[b]	.960	1	.327			
Likelihood Ratio	3.628	1	.057	.168	.168	
Fisher's Exact Test				.168	.168	
Linear-by-Linear Association	2.873[c]	1	.090	.168	.168	.168
N of Valid Cases	53					

a. 2 cells (50.0%) have expected count less than 5. The minimum expected count is .83.

b. Computed only for a 2x2 table

c. The standardized statistic is 1.695.

Characteristics of the study population

Crosstab

Count

		flowrategroup		
		normal	hypo	Total
DLP	no	28	17	45
	yes	3	5	8
Total		31	22	53

Chi-Square Tests

	Value	df	Asymptotic Significance (2-sided)	Exact Sig. (2-sided)	Exact Sig. (1-sided)	Point Probability
Pearson Chi-Square	1.710[a]	1	.191	.253	.179	
Continuity Correction[b]	.843	1	.358			
Likelihood Ratio	1.686	1	.194	.253	.179	
Fisher's Exact Test				.253	.179	
Linear-by-Linear Association	1.678[c]	1	.195	.253	.179	.134
N of Valid Cases	53					

a. 2 cells (50.0%) have expected count less than 5. The minimum expected count is 3.32.

b. Computed only for a 2x2 table

c. The standardized statistic is 1.295.

Characteristics of the study population

Crosstab

Count

		flowrategroup		
		normal	hypo	Total
OA	no	29	22	51
	yes	2	0	2
Total		31	22	53

Chi-Square Tests

	Value	df	Asymptotic Significance (2-sided)	Exact Sig. (2-sided)	Exact Sig. (1-sided)	Point Probability
Pearson Chi-Square	1.475[a]	1	.225	.505	.337	
Continuity Correction[b]	.233	1	.629			
Likelihood Ratio	2.201	1	.138	.505	.337	
Fisher's Exact Test				.505	.337	
Linear-by-Linear Association	1.447[c]	1	.229	.505	.337	.337
N of Valid Cases	53					

a. 2 cells (50.0%) have expected count less than 5. The minimum expected count is .83.

b. Computed only for a 2x2 table

c. The standardized statistic is -1.203.

Characteristics of the study population

Crosstab

Count

		flowrategroup		
		normal	hypo	Total
spondylolisthesis	no	31	20	51
	yes	0	2	2
Total		31	22	53

Chi-Square Tests

	Value	df	Asymptotic Significance (2-sided)	Exact Sig. (2-sided)	Exact Sig. (1-sided)	Point Probability
Pearson Chi-Square	2.929[a]	1	.087	.168	.168	
Continuity Correction[b]	.960	1	.327			
Likelihood Ratio	3.628	1	.057	.168	.168	
Fisher's Exact Test				.168	.168	
Linear-by-Linear Association	2.873[c]	1	.090	.168	.168	.168
N of Valid Cases	53					

a. 2 cells (50.0%) have expected count less than 5. The minimum expected count is .83.

b. Computed only for a 2x2 table

c. The standardized statistic is 1.695.

Characteristics of the study population

Crosstab

Count

		flowrategroup		
		normal	hypo	Total
Parkinson	no	31	20	51
	yes	0	2	2
Total		31	22	53

Chi-Square Tests

	Value	df	Asymptotic Significance (2-sided)	Exact Sig. (2-sided)	Exact Sig. (1-sided)	Point Probability
Pearson Chi-Square	2.929[a]	1	.087	.168	.168	
Continuity Correction[b]	.960	1	.327			
Likelihood Ratio	3.628	1	.057	.168	.168	
Fisher's Exact Test				.168	.168	
Linear-by-Linear Association	2.873[c]	1	.090	.168	.168	.168
N of Valid Cases	53					

a. 2 cells (50.0%) have expected count less than 5. The minimum expected count is .83.

b. Computed only for a 2x2 table

c. The standardized statistic is 1.695.

Characteristics of the study population

Crosstab

Count

		flowrategroup		
		normal	hypo	Total
nounderlying	no	17	17	34
	yes	14	5	19
Total		31	22	53

Chi-Square Tests

	Value	df	Asymptotic Significance (2-sided)	Exact Sig. (2-sided)	Exact Sig. (1-sided)	Point Probability
Pearson Chi-Square	2.816[a]	1	.093	.146	.082	
Continuity Correction[b]	1.925	1	.165			
Likelihood Ratio	2.903	1	.088	.146	.082	
Fisher's Exact Test				.146	.082	
Linear-by-Linear Association	2.763[c]	1	.096	.146	.082	.059
N of Valid Cases	53					

a. 0 cells (0.0%) have expected count less than 5. The minimum expected count is 7.89.

b. Computed only for a 2x2 table

c. The standardized statistic is -1.662.

Association of oral Candida colonization and salivation status

Crosstab

Count

		flowrategroup		
		normal	hypo	Total
candidaspp	no	21	7	28
	yes	10	15	25
Total		31	22	53

Chi-Square Tests

	Value	df	Asymptotic Significance (2-sided)	Exact Sig. (2-sided)	Exact Sig. (1-sided)	Point Probability
Pearson Chi-Square	6.664[a]	1	.010	.013	.010	
Continuity Correction[b]	5.300	1	.021			
Likelihood Ratio	6.797	1	.009	.013	.010	
Fisher's Exact Test				.013	.010	
Linear-by-Linear Association	6.538[c]	1	.011	.013	.010	.008
N of Valid Cases	53					

a. 0 cells (0.0%) have expected count less than 5. The minimum expected count is 10.38.

b. Computed only for a 2x2 table

c. The standardized statistic is 2.557.

Association of oral Candida colonization and salivation status

Crosstab

Count

		flowrategroup		
		normal	hypo	Total
C.albican	no	23	11	34
	yes	8	11	19
Total		31	22	53

Chi-Square Tests

	Value	df	Asymptotic Significance (2-sided)	Exact Sig. (2-sided)	Exact Sig. (1-sided)	Point Probability
Pearson Chi-Square	3.275[a]	1	.070	.088	.065	
Continuity Correction[b]	2.308	1	.129			
Likelihood Ratio	3.268	1	.071	.088	.065	
Fisher's Exact Test				.088	.065	
Linear-by-Linear Association	3.213[c]	1	.073	.088	.065	.047
N of Valid Cases	53					

a. 0 cells (0.0%) have expected count less than 5. The minimum expected count is 7.89.

b. Computed only for a 2x2 table

c. The standardized statistic is 1.793.

Association of oral Candida colonization and salivation status

Crosstab

Count

		flowrategroup		
		normal	hypo	Total
multiplespecies	no	28	16	44
	yes	3	6	9
Total		31	22	53

Chi-Square Tests

	Value	df	Asymptotic Significance (2-sided)	Exact Sig. (2-sided)	Exact Sig. (1-sided)	Point Probability
Pearson Chi-Square	2.826[a]	1	.093	.140	.096	
Continuity Correction[b]	1.716	1	.190			
Likelihood Ratio	2.798	1	.094	.140	.096	
Fisher's Exact Test				.140	.096	
Linear-by-Linear Association	2.773[c]	1	.096	.140	.096	.076
N of Valid Cases	53					

a. 1 cells (25.0%) have expected count less than 5. The minimum expected count is 3.74.

b. Computed only for a 2x2 table

c. The standardized statistic is 1.665.

Association of oral Candida colonization and salivation status

Crosstab

Count

		flowrategroup		
		normal	hypo	Total
nonalbicans	no	26	14	40
	yes	5	8	13
Total		31	22	53

Chi-Square Tests

	Value	df	Asymptotic Significance (2-sided)	Exact Sig. (2-sided)	Exact Sig. (1-sided)	Point Probability
Pearson Chi-Square	2.846[a]	1	.092	.114	.087	
Continuity Correction[b]	1.858	1	.173			
Likelihood Ratio	2.819	1	.093	.114	.087	
Fisher's Exact Test				.114	.087	
Linear-by-Linear Association	2.792[c]	1	.095	.114	.087	.065
N of Valid Cases	53					

a. 0 cells (0.0%) have expected count less than 5. The minimum expected count is 5.40.

b. Computed only for a 2x2 table

c. The standardized statistic is 1.671.

Association of oral Candida colonization and salivation status

Crosstab

Count

		flowrategroup		
		normal	hypo	Total
C.glabata	no	29	19	48
	yes	2	3	5
Total		31	22	53

Chi-Square Tests

	Value	df	Asymptotic Significance (2-sided)	Exact Sig. (2-sided)	Exact Sig. (1-sided)	Point Probability
Pearson Chi-Square	.777[a]	1	.378	.638	.338	
Continuity Correction[b]	.164	1	.686			
Likelihood Ratio	.764	1	.382	.638	.338	
Fisher's Exact Test				.638	.338	
Linear-by-Linear Association	.763[c]	1	.382	.638	.338	.250
N of Valid Cases	53					

a. 2 cells (50.0%) have expected count less than 5. The minimum expected count is 2.08.

b. Computed only for a 2x2 table

c. The standardized statistic is .873.

Association of oral Candida colonization and salivation status

Crosstab

Count

		flowrategroup		
		normal	hypo	Total
C.dubliniensis	no	30	19	49
	yes	1	3	4
Total		31	22	53

Chi-Square Tests

	Value	df	Asymptotic Significance (2-sided)	Exact Sig. (2-sided)	Exact Sig. (1-sided)	Point Probability
Pearson Chi-Square	1.999[a]	1	.157	.295	.188	
Continuity Correction[b]	.785	1	.376			
Likelihood Ratio	2.001	1	.157	.295	.188	
Fisher's Exact Test				.295	.188	
Linear-by-Linear Association	1.961[c]	1	.161	.295	.188	.163
N of Valid Cases	53					

a. 2 cells (50.0%) have expected count less than 5. The minimum expected count is 1.66.

b. Computed only for a 2x2 table

c. The standardized statistic is 1.400.

Association of oral Candida colonization and salivation status

Crosstab

Count

		flowrategroup		
		normal	hypo	Total
C.parasilosis	no	31	18	49
	yes	0	4	4
Total		31	22	53

Chi-Square Tests

	Value	df	Asymptotic Significance (2-sided)	Exact Sig. (2-sided)	Exact Sig. (1-sided)	Point Probability
Pearson Chi-Square	6.096[a]	1	.014	.025	.025	
Continuity Correction[b]	3.769	1	.052			
Likelihood Ratio	7.500	1	.006	.025	.025	
Fisher's Exact Test				.025	.025	
Linear-by-Linear Association	5.981[c]	1	.014	.025	.025	.025
N of Valid Cases	53					

a. 2 cells (50.0%) have expected count less than 5. The minimum expected count is 1.66.

b. Computed only for a 2x2 table

c. The standardized statistic is 2.446.

Association of oral Candida colonization and salivation status

Crosstab

Count

		flowrategroup		
		normal	hypo	Total
C.krusei	no	29	22	51
	yes	2	0	2
Total		31	22	53

Chi-Square Tests

	Value	df	Asymptotic Significance (2-sided)	Exact Sig. (2-sided)	Exact Sig. (1-sided)	Point Probability
Pearson Chi-Square	1.475[a]	1	.225	.505	.337	
Continuity Correction[b]	.233	1	.629			
Likelihood Ratio	2.201	1	.138	.505	.337	
Fisher's Exact Test				.505	.337	
Linear-by-Linear Association	1.447[c]	1	.229	.505	.337	.337
N of Valid Cases	53					

a. 2 cells (50.0%) have expected count less than 5. The minimum expected count is .83.

b. Computed only for a 2x2 table

c. The standardized statistic is -1.203.

Association of oral Candida colonization and salivation status

Crosstab

Count

		flowrategroup		
		normal	hypo	Total
C.tropical	no	30	22	52
	yes	1	0	1
Total		31	22	53

Chi-Square Tests

	Value	df	Asymptotic Significance (2-sided)	Exact Sig. (2-sided)	Exact Sig. (1-sided)	Point Probability
Pearson Chi-Square	.723[a]	1	.395	1.000	.585	
Continuity Correction[b]	.000	1	1.000			
Likelihood Ratio	1.086	1	.297	1.000	.585	
Fisher's Exact Test				1.000	.585	
Linear-by-Linear Association	.710[c]	1	.400	1.000	.585	.585
N of Valid Cases	53					

a. 2 cells (50.0%) have expected count less than 5. The minimum expected count is .42.

b. Computed only for a 2x2 table

c. The standardized statistic is -.842.

Association of clinical parameters and Candida colonization

Crosstab

Count

		candidaspp		
		no	yes	Total
sex	male	5	3	8
	female	23	22	45
Total		28	25	53

Chi-Square Tests

	Value	df	Asymptotic Significance (2-sided)	Exact Sig. (2-sided)	Exact Sig. (1-sided)	Point Probability
Pearson Chi-Square	.354[a]	1	.552	.708	.419	
Continuity Correction[b]	.044	1	.833			
Likelihood Ratio	.358	1	.550	.708	.419	
Fisher's Exact Test				.708	.419	
Linear-by-Linear Association	.347[c]	1	.556	.708	.419	.255
N of Valid Cases	53					

a. 2 cells (50.0%) have expected count less than 5. The minimum expected count is 3.77.

b. Computed only for a 2x2 table

c. The standardized statistic is .589.

Association of clinical parameters and Candida colonization

Crosstab

Count

		nonalbicans		
		no	yes	Total
sex	male	8	0	8
	female	32	13	45
Total		40	13	53

Chi-Square Tests

	Value	df	Asymptotic Significance (2-sided)	Exact Sig. (2-sided)	Exact Sig. (1-sided)	Point Probability
Pearson Chi-Square	3.062[a]	1	.080	.176	.087	
Continuity Correction[b]	1.700	1	.192			
Likelihood Ratio	4.948	1	.026	.103	.087	
Fisher's Exact Test				.176	.087	
Linear-by-Linear Association	3.004[c]	1	.083	.176	.087	.087
N of Valid Cases	53					

a. 1 cells (25.0%) have expected count less than 5. The minimum expected count is 1.96.

b. Computed only for a 2x2 table

c. The standardized statistic is 1.733.

Association of clinical parameters and Candida colonization

Crosstab

Count

		multiplespecies		
		no	yes	Total
sex	male	8	0	8
	female	36	9	45
Total		44	9	53

Chi-Square Tests

	Value	df	Asymptotic Significance (2-sided)	Exact Sig. (2-sided)	Exact Sig. (1-sided)	Point Probability
Pearson Chi-Square	1.927[a]	1	.165	.324	.200	
Continuity Correction[b]	.770	1	.380			
Likelihood Ratio	3.256	1	.071	.221	.200	
Fisher's Exact Test				.324	.200	
Linear-by-Linear Association	1.891[c]	1	.169	.324	.200	.200
N of Valid Cases	53					

a. 1 cells (25.0%) have expected count less than 5. The minimum expected count is 1.36.

b. Computed only for a 2x2 table

c. The standardized statistic is 1.375.

Association of clinical parameters and Candida colonization

Crosstab

Count

		candidaspp		
		no	yes	Total
drymouthdruggroup	no	10	7	17
	yes	18	18	36
Total		28	25	53

Chi-Square Tests

	Value	df	Asymptotic Significance (2-sided)	Exact Sig. (2-sided)	Exact Sig. (1-sided)	Point Probability
Pearson Chi-Square	.361[a]	1	.548	.572	.381	
Continuity Correction[b]	.094	1	.760			
Likelihood Ratio	.362	1	.547	.572	.381	
Fisher's Exact Test				.572	.381	
Linear-by-Linear Association	.354[c]	1	.552	.572	.381	.195
N of Valid Cases	53					

a. 0 cells (0.0%) have expected count less than 5. The minimum expected count is 8.02.

b. Computed only for a 2x2 table

c. The standardized statistic is .595.

Association of clinical parameters and Candida colonization

Crosstab

Count

		nonalbicans		
		no	yes	Total
drymouthdruggroup	no	11	6	17
	yes	29	7	36
Total		40	13	53

Chi-Square Tests

	Value	df	Asymptotic Significance (2-sided)	Exact Sig. (2-sided)	Exact Sig. (1-sided)	Point Probability
Pearson Chi-Square	1.567[a]	1	.211	.306	.181	
Continuity Correction[b]	.828	1	.363			
Likelihood Ratio	1.510	1	.219	.306	.181	
Fisher's Exact Test				.306	.181	
Linear-by-Linear Association	1.537[c]	1	.215	.306	.181	.123
N of Valid Cases	53					

a. 1 cells (25.0%) have expected count less than 5. The minimum expected count is 4.17.

b. Computed only for a 2x2 table

c. The standardized statistic is -1.240.

Association of clinical parameters and Candida colonization

Crosstab

Count

		multiplespecies		
		no	yes	Total
drymouthdruggroup	no	13	4	17
	yes	31	5	36
Total		44	9	53

Chi-Square Tests

	Value	df	Asymptotic Significance (2-sided)	Exact Sig. (2-sided)	Exact Sig. (1-sided)	Point Probability
Pearson Chi-Square	.761[a]	1	.383	.445	.308	
Continuity Correction[b]	.231	1	.631			
Likelihood Ratio	.730	1	.393	.445	.308	
Fisher's Exact Test				.445	.308	
Linear-by-Linear Association	.747[c]	1	.387	.445	.308	.202
N of Valid Cases	53					

a. 1 cells (25.0%) have expected count less than 5. The minimum expected count is 2.89.

b. Computed only for a 2x2 table

c. The standardized statistic is -.864.

Association of clinical parameters and Candida colonization

Crosstab

Count

		candidaspp		
		no	yes	Total
subdrymouthgroup	no	10	5	15
	yes	18	20	38
Total		28	25	53

Chi-Square Tests

	Value	df	Asymptotic Significance (2-sided)	Exact Sig. (2-sided)	Exact Sig. (1-sided)	Point Probability
Pearson Chi-Square	1.607[a]	1	.205	.237	.168	
Continuity Correction[b]	.926	1	.336			
Likelihood Ratio	1.634	1	.201	.237	.168	
Fisher's Exact Test				.237	.168	
Linear-by-Linear Association	1.577[c]	1	.209	.237	.168	.112
N of Valid Cases	53					

a. 0 cells (0.0%) have expected count less than 5. The minimum expected count is 7.08.

b. Computed only for a 2x2 table

c. The standardized statistic is 1.256.

Association of clinical parameters and Candida colonization

Crosstab

Count

		nonalbicans		
		no	yes	Total
subdrymouthgroup	no	12	3	15
	yes	28	10	38
Total		40	13	53

Chi-Square Tests

	Value	df	Asymptotic Significance (2-sided)	Exact Sig. (2-sided)	Exact Sig. (1-sided)	Point Probability
Pearson Chi-Square	.232[a]	1	.630	.736	.461	
Continuity Correction[b]	.016	1	.899			
Likelihood Ratio	.238	1	.625	.736	.461	
Fisher's Exact Test				.736	.461	
Linear-by-Linear Association	.227[c]	1	.633	.736	.461	.256
N of Valid Cases	53					

a. 1 cells (25.0%) have expected count less than 5. The minimum expected count is 3.68.

b. Computed only for a 2x2 table

c. The standardized statistic is .477.

Association of clinical parameters and Candida colonization

Crosstab

Count

		multiplespecies		
		no	yes	Total
subdrymouthgroup	no	14	1	15
	yes	30	8	38
Total		44	9	53

Chi-Square Tests

	Value	df	Asymptotic Significance (2-sided)	Exact Sig. (2-sided)	Exact Sig. (1-sided)	Point Probability
Pearson Chi-Square	1.579[a]	1	.209	.263	.202	
Continuity Correction[b]	.723	1	.395			
Likelihood Ratio	1.831	1	.176	.263	.202	
Fisher's Exact Test				.418	.202	
Linear-by-Linear Association	1.549[c]	1	.213	.263	.202	.166
N of Valid Cases	53					

a. 1 cells (25.0%) have expected count less than 5. The minimum expected count is 2.55.

b. Computed only for a 2x2 table

c. The standardized statistic is 1.245.

Association of clinical parameters and Candida colonization

Crosstab

Count

		candidaspp		
		no	yes	Total
objdrymouthgroup	no	22	12	34
	yes	6	13	19
Total		28	25	53

Chi-Square Tests

	Value	df	Asymptotic Significance (2-sided)	Exact Sig. (2-sided)	Exact Sig. (1-sided)	Point Probability
Pearson Chi-Square	5.368[a]	1	.021	.025	.021	
Continuity Correction[b]	4.120	1	.042			
Likelihood Ratio	5.456	1	.020	.025	.021	
Fisher's Exact Test				.025	.021	
Linear-by-Linear Association	5.266[c]	1	.022	.025	.021	.016
N of Valid Cases	53					

a. 0 cells (0.0%) have expected count less than 5. The minimum expected count is 8.96.

b. Computed only for a 2x2 table

c. The standardized statistic is 2.295.

Association of clinical parameters and Candida colonization

Crosstab

Count

		nonalbicans		
		no	yes	Total
objdrymouthgroup	no	28	6	34
	yes	12	7	19
Total		40	13	53

Chi-Square Tests

	Value	df	Asymptotic Significance (2-sided)	Exact Sig. (2-sided)	Exact Sig. (1-sided)	Point Probability
Pearson Chi-Square	2.426[a]	1	.119	.183	.111	
Continuity Correction[b]	1.500	1	.221			
Likelihood Ratio	2.356	1	.125	.183	.111	
Fisher's Exact Test				.183	.111	
Linear-by-Linear Association	2.380[c]	1	.123	.183	.111	.081
N of Valid Cases	53					

a. 1 cells (25.0%) have expected count less than 5. The minimum expected count is 4.66.

b. Computed only for a 2x2 table

c. The standardized statistic is 1.543.

Association of clinical parameters and Candida colonization

Crosstab

Count

		multiplespecies		
		no	yes	Total
objdrymouthgroup	no	30	4	34
	yes	14	5	19
Total		44	9	53

Chi-Square Tests

	Value	df	Asymptotic Significance (2-sided)	Exact Sig. (2-sided)	Exact Sig. (1-sided)	Point Probability
Pearson Chi-Square	1.831[a]	1	.176	.255	.165	
Continuity Correction[b]	.944	1	.331			
Likelihood Ratio	1.761	1	.184	.255	.165	
Fisher's Exact Test				.255	.165	
Linear-by-Linear Association	1.796[c]	1	.180	.255	.165	.122
N of Valid Cases	53					

a. 1 cells (25.0%) have expected count less than 5. The minimum expected count is 3.23.

b. Computed only for a 2x2 table

c. The standardized statistic is 1.340.

Association of clinical parameters and Candida colonization

Crosstab

Count

		candidaspp		
		no	yes	Total
flowrategroup	normal	21	10	31
	hypo	7	15	22
Total		28	25	53

Chi-Square Tests

	Value	df	Asymptotic Significance (2-sided)	Exact Sig. (2-sided)	Exact Sig. (1-sided)	Point Probability
Pearson Chi-Square	6.664[a]	1	.010	.013	.010	
Continuity Correction[b]	5.300	1	.021			
Likelihood Ratio	6.797	1	.009	.013	.010	
Fisher's Exact Test				.013	.010	
Linear-by-Linear Association	6.538[c]	1	.011	.013	.010	.008
N of Valid Cases	53					

a. 0 cells (0.0%) have expected count less than 5. The minimum expected count is 10.38.

b. Computed only for a 2x2 table

c. The standardized statistic is 2.557.

Association of clinical parameters and Candida colonization

Crosstab

Count

		nonalbicans		
		no	yes	Total
flowrategroup	normal	26	5	31
	hypo	14	8	22
Total		40	13	53

Chi-Square Tests

	Value	df	Asymptotic Significance (2-sided)	Exact Sig. (2-sided)	Exact Sig. (1-sided)	Point Probability
Pearson Chi-Square	2.846[a]	1	.092	.114	.087	
Continuity Correction[b]	1.858	1	.173			
Likelihood Ratio	2.819	1	.093	.114	.087	
Fisher's Exact Test				.114	.087	
Linear-by-Linear Association	2.792[c]	1	.095	.114	.087	.065
N of Valid Cases	53					

a. 0 cells (0.0%) have expected count less than 5. The minimum expected count is 5.40.

b. Computed only for a 2x2 table

c. The standardized statistic is 1.671.

Association of clinical parameters and Candida colonization

Crosstab

Count

		multiplespecies		
		no	yes	Total
flowrategroup	normal	28	3	31
	hypo	16	6	22
Total		44	9	53

Chi-Square Tests

	Value	df	Asymptotic Significance (2-sided)	Exact Sig. (2-sided)	Exact Sig. (1-sided)	Point Probability
Pearson Chi-Square	2.826[a]	1	.093	.140	.096	
Continuity Correction[b]	1.716	1	.190			
Likelihood Ratio	2.798	1	.094	.140	.096	
Fisher's Exact Test				.140	.096	
Linear-by-Linear Association	2.773[c]	1	.096	.140	.096	.076
N of Valid Cases	53					

a. 1 cells (25.0%) have expected count less than 5. The minimum expected count is 3.74.

b. Computed only for a 2x2 table

c. The standardized statistic is 1.665.

Association of clinical parameters and Candida colonization

Crosstab

Count

		candidaspp		
		no	yes	Total
brushaftermealgroup	no	17	11	28
	yes	11	14	25
Total		28	25	53

Chi-Square Tests

	Value	df	Asymptotic Significance (2-sided)	Exact Sig. (2-sided)	Exact Sig. (1-sided)	Point Probability
Pearson Chi-Square	1.481[a]	1	.224	.276	.173	
Continuity Correction[b]	.886	1	.347			
Likelihood Ratio	1.487	1	.223	.276	.173	
Fisher's Exact Test				.276	.173	
Linear-by-Linear Association	1.453[c]	1	.228	.276	.173	.106
N of Valid Cases	53					

a. 0 cells (0.0%) have expected count less than 5. The minimum expected count is 11.79.

b. Computed only for a 2x2 table

c. The standardized statistic is 1.205.

Crosstab

Count

		nonalbicans		
		no	yes	Total
brushaftermealgroup	no	22	6	28
	yes	18	7	25
Total		40	13	53

Chi-Square Tests

	Value	df	Asymptotic Significance (2-sided)	Exact Sig. (2-sided)	Exact Sig. (1-sided)	Point Probability
Pearson Chi-Square	.308[a]	1	.579	.751	.406	
Continuity Correction[b]	.055	1	.814			
Likelihood Ratio	.308	1	.579	.751	.406	
Fisher's Exact Test				.751	.406	
Linear-by-Linear Association	.302[c]	1	.582	.751	.406	.215
N of Valid Cases	53					

a. 0 cells (0.0%) have expected count less than 5. The minimum expected count is 6.13.

b. Computed only for a 2x2 table

c. The standardized statistic is .550.

Association of clinical parameters and Candida colonization

Crosstab

Count

		multiplespecies		
		no	yes	Total
brushaftermealgroup	no	24	4	28
	yes	20	5	25
Total		44	9	53

Chi-Square Tests

	Value	df	Asymptotic Significance (2-sided)	Exact Sig. (2-sided)	Exact Sig. (1-sided)	Point Probability
Pearson Chi-Square	.306[a]	1	.580	.719	.425	
Continuity Correction[b]	.035	1	.852			
Likelihood Ratio	.306	1	.580	.719	.425	
Fisher's Exact Test				.719	.425	
Linear-by-Linear Association	.300[c]	1	.584	.719	.425	.245
N of Valid Cases	53					

a. 2 cells (50.0%) have expected count less than 5. The minimum expected count is 4.25.

b. Computed only for a 2x2 table

c. The standardized statistic is .548.

Association of clinical parameters and Candida colonization

Crosstab

Count

		candidaspp		
		no	yes	Total
dentureusegroup	no	25	17	42
	yes	3	8	11
Total		28	25	53

Chi-Square Tests

	Value	df	Asymptotic Significance (2-sided)	Exact Sig. (2-sided)	Exact Sig. (1-sided)	Point Probability
Pearson Chi-Square	3.638[a]	1	.056	.090	.058	
Continuity Correction[b]	2.459	1	.117			
Likelihood Ratio	3.722	1	.054	.090	.058	
Fisher's Exact Test				.090	.058	
Linear-by-Linear Association	3.570[c]	1	.059	.090	.058	.046
N of Valid Cases	53					

a. 0 cells (0.0%) have expected count less than 5. The minimum expected count is 5.19.

b. Computed only for a 2x2 table

c. The standardized statistic is 1.889.

Association of clinical parameters and Candida colonization

Crosstab

Count

		nonalbicans		
		no	yes	Total
dentureusegroup	no	35	7	42
	yes	5	6	11
Total		40	13	53

Chi-Square Tests

	Value	df	Asymptotic Significance (2-sided)	Exact Sig. (2-sided)	Exact Sig. (1-sided)	Point Probability
Pearson Chi-Square	6.756[a]	1	.009	.017	.017	
Continuity Correction[b]	4.865	1	.027			
Likelihood Ratio	6.047	1	.014	.047	.017	
Fisher's Exact Test				.017	.017	
Linear-by-Linear Association	6.629[c]	1	.010	.017	.017	.015
N of Valid Cases	53					

a. 1 cells (25.0%) have expected count less than 5. The minimum expected count is 2.70.

b. Computed only for a 2x2 table

c. The standardized statistic is 2.575.

Association of clinical parameters and Candida colonization

Crosstab

Count

		multiplespecies		
		no	yes	Total
dentureusegroup	no	37	5	42
	yes	7	4	11
Total		44	9	53

Chi-Square Tests

	Value	df	Asymptotic Significance (2-sided)	Exact Sig. (2-sided)	Exact Sig. (1-sided)	Point Probability
Pearson Chi-Square	3.699[a]	1	.054	.076	.076	
Continuity Correction[b]	2.168	1	.141			
Likelihood Ratio	3.210	1	.073	.177	.076	
Fisher's Exact Test				.076	.076	
Linear-by-Linear Association	3.629[c]	1	.057	.076	.076	.063
N of Valid Cases	53					

a. 1 cells (25.0%) have expected count less than 5. The minimum expected count is 1.87.

b. Computed only for a 2x2 table

c. The standardized statistic is 1.905.

Association of clinical parameters and Candida colonization

Crosstab

Count

		candidaspp		
		no	yes	Total
systemiccon	no	17	17	34
	yes	11	8	19
Total		28	25	53

Chi-Square Tests

	Value	df	Asymptotic Significance (2-sided)	Exact Sig. (2-sided)	Exact Sig. (1-sided)	Point Probability
Pearson Chi-Square	.305[a]	1	.581	.775	.396	
Continuity Correction[b]	.070	1	.791			
Likelihood Ratio	.306	1	.580	.775	.396	
Fisher's Exact Test				.775	.396	
Linear-by-Linear Association	.299[c]	1	.584	.775	.396	.195
N of Valid Cases	53					

a. 0 cells (0.0%) have expected count less than 5. The minimum expected count is 8.96.

b. Computed only for a 2x2 table

c. The standardized statistic is -.547.

Association of clinical parameters and Candida colonization

Crosstab

Count

		nonalbicans		
		no	yes	Total
systemiccon	no	28	6	34
	yes	12	7	19
Total		40	13	53

Chi-Square Tests

	Value	df	Asymptotic Significance (2-sided)	Exact Sig. (2-sided)	Exact Sig. (1-sided)	Point Probability
Pearson Chi-Square	2.426[a]	1	.119	.183	.111	
Continuity Correction[b]	1.500	1	.221			
Likelihood Ratio	2.356	1	.125	.183	.111	
Fisher's Exact Test				.183	.111	
Linear-by-Linear Association	2.380[c]	1	.123	.183	.111	.081
N of Valid Cases	53					

a. 1 cells (25.0%) have expected count less than 5. The minimum expected count is 4.66.

b. Computed only for a 2x2 table

c. The standardized statistic is 1.543.

Association of clinical parameters and Candida colonization

Crosstab

Count

		multiplespecies		
		no	yes	Total
systemiccon	no	30	4	34
	yes	14	5	19
Total		44	9	53

Chi-Square Tests

	Value	df	Asymptotic Significance (2-sided)	Exact Sig. (2-sided)	Exact Sig. (1-sided)	Point Probability
Pearson Chi-Square	1.831[a]	1	.176	.255	.165	
Continuity Correction[b]	.944	1	.331			
Likelihood Ratio	1.761	1	.184	.255	.165	
Fisher's Exact Test				.255	.165	
Linear-by-Linear Association	1.796[c]	1	.180	.255	.165	.122
N of Valid Cases	53					

a. 1 cells (25.0%) have expected count less than 5. The minimum expected count is 3.23.

b. Computed only for a 2x2 table

c. The standardized statistic is 1.340.

Association of clinical parameters and Candida colonization

Crosstab

Count

		candidaspp		
		no	yes	Total
cardiovascular	no	15	16	31
	yes	13	9	22
Total		28	25	53

Chi-Square Tests

	Value	df	Asymptotic Significance (2-sided)	Exact Sig. (2-sided)	Exact Sig. (1-sided)	Point Probability
Pearson Chi-Square	.592[a]	1	.442	.578	.313	
Continuity Correction[b]	.240	1	.624			
Likelihood Ratio	.594	1	.441	.578	.313	
Fisher's Exact Test				.578	.313	
Linear-by-Linear Association	.580[c]	1	.446	.578	.313	.165
N of Valid Cases	53					

a. 0 cells (0.0%) have expected count less than 5. The minimum expected count is 10.38.

b. Computed only for a 2x2 table

c. The standardized statistic is -.762.

Association of systemic diseases and Candida colonization

Crosstab

Count

		nonalbicans		
		no	yes	Total
cardiovascular	no	22	9	31
	yes	18	4	22
Total		40	13	53

Chi-Square Tests

	Value	df	Asymptotic Significance (2-sided)	Exact Sig. (2-sided)	Exact Sig. (1-sided)	Point Probability
Pearson Chi-Square	.818[a]	1	.366	.520	.284	
Continuity Correction[b]	.337	1	.561			
Likelihood Ratio	.838	1	.360	.520	.284	
Fisher's Exact Test				.520	.284	
Linear-by-Linear Association	.803[c]	1	.370	.520	.284	.175
N of Valid Cases	53					

a. 0 cells (0.0%) have expected count less than 5. The minimum expected count is 5.40.

b. Computed only for a 2x2 table

c. The standardized statistic is -.896.

Association of systemic diseases and Candida colonization

Crosstab

Count

		multiplespecies		
		no	yes	Total
cardiovascular	no	24	7	31
	yes	20	2	22
Total		44	9	53

Chi-Square Tests

	Value	df	Asymptotic Significance (2-sided)	Exact Sig. (2-sided)	Exact Sig. (1-sided)	Point Probability
Pearson Chi-Square	1.661[a]	1	.197	.277	.181	
Continuity Correction[b]	.842	1	.359			
Likelihood Ratio	1.770	1	.183	.277	.181	
Fisher's Exact Test				.277	.181	
Linear-by-Linear Association	1.630[c]	1	.202	.277	.181	.137
N of Valid Cases	53					

a. 1 cells (25.0%) have expected count less than 5. The minimum expected count is 3.74.

b. Computed only for a 2x2 table

c. The standardized statistic is -1.277.

Association of systemic diseases and Candida colonization

Crosstab

Count

		candidaspp		
		no	yes	Total
CKD	no	24	24	48
	yes	4	1	5
Total		28	25	53

Chi-Square Tests

	Value	df	Asymptotic Significance (2-sided)	Exact Sig. (2-sided)	Exact Sig. (1-sided)	Point Probability
Pearson Chi-Square	1.635[a]	1	.201	.355	.213	
Continuity Correction[b]	.653	1	.419			
Likelihood Ratio	1.758	1	.185	.355	.213	
Fisher's Exact Test				.355	.213	
Linear-by-Linear Association	1.605[c]	1	.205	.355	.213	.178
N of Valid Cases	53					

a. 2 cells (50.0%) have expected count less than 5. The minimum expected count is 2.36.

b. Computed only for a 2x2 table

c. The standardized statistic is -1.267.

Association of systemic diseases and Candida colonization

Crosstab

Count

		nonalbicans		
		no	yes	Total
CKD	no	35	13	48
	yes	5	0	5
Total		40	13	53

Chi-Square Tests

	Value	df	Asymptotic Significance (2-sided)	Exact Sig. (2-sided)	Exact Sig. (1-sided)	Point Probability
Pearson Chi-Square	1.794[a]	1	.180	.317	.229	
Continuity Correction[b]	.629	1	.428			
Likelihood Ratio	2.980	1	.084	.317	.229	
Fisher's Exact Test				.317	.229	
Linear-by-Linear Association	1.760[c]	1	.185	.317	.229	.229
N of Valid Cases	53					

a. 2 cells (50.0%) have expected count less than 5. The minimum expected count is 1.23.

b. Computed only for a 2x2 table

c. The standardized statistic is -1.327.

Association of systemic diseases and Candida colonization

Crosstab

Count

		multiplespecies		
		no	yes	Total
CKD	no	39	9	48
	yes	5	0	5
Total		44	9	53

Chi-Square Tests

	Value	df	Asymptotic Significance (2-sided)	Exact Sig. (2-sided)	Exact Sig. (1-sided)	Point Probability
Pearson Chi-Square	1.129[a]	1	.288	.574	.378	
Continuity Correction[b]	.191	1	.662			
Likelihood Ratio	1.965	1	.161	.408	.378	
Fisher's Exact Test				.574	.378	
Linear-by-Linear Association	1.108[c]	1	.293	.574	.378	.378
N of Valid Cases	53					

a. 2 cells (50.0%) have expected count less than 5. The minimum expected count is .85.

b. Computed only for a 2x2 table

c. The standardized statistic is -1.053.

Association of systemic diseases and Candida colonization

Crosstab

Count

		candidaspp		
		no	yes	Total
osteoporosis	no	25	25	50
	yes	3	0	3
Total		28	25	53

Chi-Square Tests

	Value	df	Asymptotic Significance (2-sided)	Exact Sig. (2-sided)	Exact Sig. (1-sided)	Point Probability
Pearson Chi-Square	2.839[a]	1	.092	.238	.140	
Continuity Correction[b]	1.187	1	.276			
Likelihood Ratio	3.989	1	.046	.238	.140	
Fisher's Exact Test				.238	.140	
Linear-by-Linear Association	2.786[c]	1	.095	.238	.140	.140
N of Valid Cases	53					

a. 2 cells (50.0%) have expected count less than 5. The minimum expected count is 1.42.

b. Computed only for a 2x2 table

c. The standardized statistic is -1.669.

Association of systemic diseases and Candida colonization

Crosstab

Count

		nonalbicans		
		no	yes	Total
osteoporosis	no	37	13	50
	yes	3	0	3
Total		40	13	53

Chi-Square Tests

	Value	df	Asymptotic Significance (2-sided)	Exact Sig. (2-sided)	Exact Sig. (1-sided)	Point Probability
Pearson Chi-Square	1.034[a]	1	.309	.567	.422	
Continuity Correction[b]	.106	1	.745			
Likelihood Ratio	1.746	1	.186	.567	.422	
Fisher's Exact Test				.567	.422	
Linear-by-Linear Association	1.014[c]	1	.314	.567	.422	.422
N of Valid Cases	53					

a. 2 cells (50.0%) have expected count less than 5. The minimum expected count is .74.

b. Computed only for a 2x2 table

c. The standardized statistic is -1.007.

Association of systemic diseases and Candida colonization

Crosstab

Count

		multiplespecies		
		no	yes	Total
osteoporosis	no	41	9	50
	yes	3	0	3
Total		44	9	53

Chi-Square Tests

	Value	df	Asymptotic Significance (2-sided)	Exact Sig. (2-sided)	Exact Sig. (1-sided)	Point Probability
Pearson Chi-Square	.650[a]	1	.420	.637	.565	
Continuity Correction[b]	.000	1	.988			
Likelihood Ratio	1.153	1	.283	.637	.565	
Fisher's Exact Test				1.000	.565	
Linear-by-Linear Association	.638[c]	1	.424	.637	.565	.565
N of Valid Cases	53					

a. 2 cells (50.0%) have expected count less than 5. The minimum expected count is .51.

b. Computed only for a 2x2 table

c. The standardized statistic is -.799.

Association of systemic diseases and Candida colonization

Crosstab

Count

		candidaspp		
		no	yes	Total
depressive	no	28	22	50
	yes	0	3	3
Total		28	25	53

Chi-Square Tests

	Value	df	Asymptotic Significance (2-sided)	Exact Sig. (2-sided)	Exact Sig. (1-sided)	Point Probability
Pearson Chi-Square	3.562[a]	1	.059	.098	.098	
Continuity Correction[b]	1.669	1	.196			
Likelihood Ratio	4.711	1	.030	.098	.098	
Fisher's Exact Test				.098	.098	
Linear-by-Linear Association	3.494[c]	1	.062	.098	.098	.098
N of Valid Cases	53					

a. 2 cells (50.0%) have expected count less than 5. The minimum expected count is 1.42.

b. Computed only for a 2x2 table

c. The standardized statistic is 1.869.

Association of systemic diseases and Candida colonization

Crosstab

Count

		multiplespecies		
		no	yes	Total
depressive	no	42	8	50
	yes	2	1	3
Total		44	9	53

Chi-Square Tests

	Value	df	Asymptotic Significance (2-sided)	Exact Sig. (2-sided)	Exact Sig. (1-sided)	Point Probability
Pearson Chi-Square	.603[a]	1	.437	1.000	.435	
Continuity Correction[b]	.000	1	1.000			
Likelihood Ratio	.506	1	.477	1.000	.435	
Fisher's Exact Test				.435	.435	
Linear-by-Linear Association	.592[c]	1	.442	1.000	.435	.363
N of Valid Cases	53					

a. 2 cells (50.0%) have expected count less than 5. The minimum expected count is .51.

b. Computed only for a 2x2 table

c. The standardized statistic is .769.

Association of systemic diseases and Candida colonization

Crosstab

Count

		candidaspp		
		no	yes	Total
DM	no	27	22	49
	yes	1	3	4
Total		28	25	53

Chi-Square Tests

	Value	df	Asymptotic Significance (2-sided)	Exact Sig. (2-sided)	Exact Sig. (1-sided)	Point Probability
Pearson Chi-Square	1.345[a]	1	.246	.333	.263	
Continuity Correction[b]	.408	1	.523			
Likelihood Ratio	1.388	1	.239	.333	.263	
Fisher's Exact Test				.333	.263	
Linear-by-Linear Association	1.319[c]	1	.251	.333	.263	.220
N of Valid Cases	53					

a. 2 cells (50.0%) have expected count less than 5. The minimum expected count is 1.89.

b. Computed only for a 2x2 table

c. The standardized statistic is 1.149.

Association of systemic diseases and Candida colonization

Crosstab

Count

		nonalbicans		
		no	yes	Total
DM	no	39	10	49
	yes	1	3	4
Total		40	13	53

Chi-Square Tests

	Value	df	Asymptotic Significance (2-sided)	Exact Sig. (2-sided)	Exact Sig. (1-sided)	Point Probability
Pearson Chi-Square	5.954[a]	1	.015	.042	.042	
Continuity Correction[b]	3.370	1	.066			
Likelihood Ratio	4.964	1	.026	.042	.042	
Fisher's Exact Test				.042	.042	
Linear-by-Linear Association	5.841[c]	1	.016	.042	.042	.039
N of Valid Cases	53					

a. 2 cells (50.0%) have expected count less than 5. The minimum expected count is .98.

b. Computed only for a 2x2 table

c. The standardized statistic is 2.417.

Association of systemic diseases and Candida colonization

Crosstab

Count

		candidaspp		
		no	yes	Total
cerebrovascular	no	28	23	51
	yes	0	2	2
Total		28	25	53

Chi-Square Tests

	Value	df	Asymptotic Significance (2-sided)	Exact Sig. (2-sided)	Exact Sig. (1-sided)	Point Probability
Pearson Chi-Square	2.328[a]	1	.127	.218	.218	
Continuity Correction[b]	.646	1	.422			
Likelihood Ratio	3.094	1	.079	.218	.218	
Fisher's Exact Test				.218	.218	
Linear-by-Linear Association	2.284[c]	1	.131	.218	.218	.218
N of Valid Cases	53					

a. 2 cells (50.0%) have expected count less than 5. The minimum expected count is .94.

b. Computed only for a 2x2 table

c. The standardized statistic is 1.511.

Association of systemic diseases and Candida colonization

Crosstab

Count

		nonalbicans		
		no	yes	Total
cerebrovascular	no	38	13	51
	yes	2	0	2
Total		40	13	53

Chi-Square Tests

	Value	df	Asymptotic Significance (2-sided)	Exact Sig. (2-sided)	Exact Sig. (1-sided)	Point Probability
Pearson Chi-Square	.675[a]	1	.411	1.000	.566	
Continuity Correction[b]	.000	1	1.000			
Likelihood Ratio	1.151	1	.283	.623	.566	
Fisher's Exact Test				1.000	.566	
Linear-by-Linear Association	.663[c]	1	.416	1.000	.566	.566
N of Valid Cases	53					

a. 2 cells (50.0%) have expected count less than 5. The minimum expected count is .49.

b. Computed only for a 2x2 table

c. The standardized statistic is -.814.

Association of systemic diseases and Candida colonization

Crosstab

Count

		multiplespecies		
		no	yes	Total
cerebrovascular	no	42	9	51
	yes	2	0	2
Total		44	9	53

Chi-Square Tests

	Value	df	Asymptotic Significance (2-sided)	Exact Sig. (2-sided)	Exact Sig. (1-sided)	Point Probability
Pearson Chi-Square	.425[a]	1	.514	1.000	.687	
Continuity Correction[b]	.000	1	1.000			
Likelihood Ratio	.760	1	.383	1.000	.687	
Fisher's Exact Test				1.000	.687	
Linear-by-Linear Association	.417[c]	1	.518	1.000	.687	.687
N of Valid Cases	53					

a. 2 cells (50.0%) have expected count less than 5. The minimum expected count is .34.

b. Computed only for a 2x2 table

c. The standardized statistic is -.646.

Association of systemic diseases and Candida colonization

Crosstab

Count

		candidaspp		
		no	yes	Total
DLP	no	22	23	45
	yes	6	2	8
Total		28	25	53

Chi-Square Tests

	Value	df	Asymptotic Significance (2-sided)	Exact Sig. (2-sided)	Exact Sig. (1-sided)	Point Probability
Pearson Chi-Square	1.858[a]	1	.173	.256	.164	
Continuity Correction[b]	.958	1	.328			
Likelihood Ratio	1.945	1	.163	.256	.164	
Fisher's Exact Test				.256	.164	
Linear-by-Linear Association	1.823[c]	1	.177	.256	.164	.128
N of Valid Cases	53					

a. 2 cells (50.0%) have expected count less than 5. The minimum expected count is 3.77.

b. Computed only for a 2x2 table

c. The standardized statistic is -1.350.

Association of systemic diseases and Candida colonization

Crosstab

Count

		nonalbicans		
		no	yes	Total
DLP	no	32	13	45
	yes	8	0	8
Total		40	13	53

Chi-Square Tests

	Value	df	Asymptotic Significance (2-sided)	Exact Sig. (2-sided)	Exact Sig. (1-sided)	Point Probability
Pearson Chi-Square	3.062[a]	1	.080	.176	.087	
Continuity Correction[b]	1.700	1	.192			
Likelihood Ratio	4.948	1	.026	.103	.087	
Fisher's Exact Test				.176	.087	
Linear-by-Linear Association	3.004[c]	1	.083	.176	.087	.087
N of Valid Cases	53					

a. 1 cells (25.0%) have expected count less than 5. The minimum expected count is 1.96.

b. Computed only for a 2x2 table

c. The standardized statistic is -1.733.

Association of systemic diseases and Candida colonization

Crosstab

Count

		multiplespecies		
		no	yes	Total
DLP	no	36	9	45
	yes	8	0	8
Total		44	9	53

Chi-Square Tests

	Value	df	Asymptotic Significance (2-sided)	Exact Sig. (2-sided)	Exact Sig. (1-sided)	Point Probability
Pearson Chi-Square	1.927[a]	1	.165	.324	.200	
Continuity Correction[b]	.770	1	.380			
Likelihood Ratio	3.256	1	.071	.221	.200	
Fisher's Exact Test				.324	.200	
Linear-by-Linear Association	1.891[c]	1	.169	.324	.200	.200
N of Valid Cases	53					

a. 1 cells (25.0%) have expected count less than 5. The minimum expected count is 1.36.

b. Computed only for a 2x2 table

c. The standardized statistic is -1.375.

Association of systemic diseases and Candida colonization

Crosstab

Count

		candidaspp		
		no	yes	Total
asthma	no	28	24	52
	yes	0	1	1
Total		28	25	53

Chi-Square Tests

	Value	df	Asymptotic Significance (2-sided)	Exact Sig. (2-sided)	Exact Sig. (1-sided)	Point Probability
Pearson Chi-Square	1.142[a]	1	.285	.472	.472	
Continuity Correction[b]	.003	1	.954			
Likelihood Ratio	1.524	1	.217	.472	.472	
Fisher's Exact Test				.472	.472	
Linear-by-Linear Association	1.120[c]	1	.290	.472	.472	.472
N of Valid Cases	53					

a. 2 cells (50.0%) have expected count less than 5. The minimum expected count is .47.

b. Computed only for a 2x2 table

c. The standardized statistic is 1.058.

Association of systemic diseases and Candida colonization

Crosstab

Count

		nonalbicans		
		no	yes	Total
asthma	no	39	13	52
	yes	1	0	1
Total		40	13	53

Chi-Square Tests

	Value	df	Asymptotic Significance (2-sided)	Exact Sig. (2-sided)	Exact Sig. (1-sided)	Point Probability
Pearson Chi-Square	.331[a]	1	.565	1.000	.755	
Continuity Correction[b]	.000	1	1.000			
Likelihood Ratio	.569	1	.451	1.000	.755	
Fisher's Exact Test				1.000	.755	
Linear-by-Linear Association	.325[c]	1	.569	1.000	.755	.755
N of Valid Cases	53					

a. 2 cells (50.0%) have expected count less than 5. The minimum expected count is .25.

b. Computed only for a 2x2 table

c. The standardized statistic is -.570.

Association of systemic diseases and Candida colonization

Crosstab

Count

		multiplespecies		
		no	yes	Total
asthma	no	43	9	52
	yes	1	0	1
Total		44	9	53

Chi-Square Tests

	Value	df	Asymptotic Significance (2-sided)	Exact Sig. (2-sided)	Exact Sig. (1-sided)	Point Probability
Pearson Chi-Square	.208[a]	1	.648	1.000	.830	
Continuity Correction[b]	.000	1	1.000			
Likelihood Ratio	.376	1	.540	1.000	.830	
Fisher's Exact Test				1.000	.830	
Linear-by-Linear Association	.205[c]	1	.651	1.000	.830	.830
N of Valid Cases	53					

a. 2 cells (50.0%) have expected count less than 5. The minimum expected count is .17.

b. Computed only for a 2x2 table

c. The standardized statistic is -.452.

Association of systemic diseases and Candida colonization

Crosstab

Count

		candidaspp		
		no	yes	Total
OA	no	27	24	51
	yes	1	1	2
Total		28	25	53

Chi-Square Tests

	Value	df	Asymptotic Significance (2-sided)	Exact Sig. (2-sided)	Exact Sig. (1-sided)	Point Probability
Pearson Chi-Square	.007[a]	1	.935	1.000	.726	
Continuity Correction[b]	.000	1	1.000			
Likelihood Ratio	.007	1	.935	1.000	.726	
Fisher's Exact Test				1.000	.726	
Linear-by-Linear Association	.007[c]	1	.935	1.000	.726	.508
N of Valid Cases	53					

a. 2 cells (50.0%) have expected count less than 5. The minimum expected count is .94.

b. Computed only for a 2x2 table

c. The standardized statistic is .081.

Association of systemic diseases and Candida colonization

Crosstab

Count

		nonalbicans		
		no	yes	Total
OA	no	38	13	51
	yes	2	0	2
Total		40	13	53

Chi-Square Tests

	Value	df	Asymptotic Significance (2-sided)	Exact Sig. (2-sided)	Exact Sig. (1-sided)	Point Probability
Pearson Chi-Square	.675[a]	1	.411	1.000	.566	
Continuity Correction[b]	.000	1	1.000			
Likelihood Ratio	1.151	1	.283	.623	.566	
Fisher's Exact Test				1.000	.566	
Linear-by-Linear Association	.663[c]	1	.416	1.000	.566	.566
N of Valid Cases	53					

a. 2 cells (50.0%) have expected count less than 5. The minimum expected count is .49.

b. Computed only for a 2x2 table

c. The standardized statistic is -.814.

Association of systemic diseases and Candida colonization

Crosstab

Count

		multiplespecies		
		no	yes	Total
OA	no	42	9	51
	yes	2	0	2
Total		44	9	53

Chi-Square Tests

	Value	df	Asymptotic Significance (2-sided)	Exact Sig. (2-sided)	Exact Sig. (1-sided)	Point Probability
Pearson Chi-Square	.425[a]	1	.514	1.000	.687	
Continuity Correction[b]	.000	1	1.000			
Likelihood Ratio	.760	1	.383	1.000	.687	
Fisher's Exact Test				1.000	.687	
Linear-by-Linear Association	.417[c]	1	.518	1.000	.687	.687
N of Valid Cases	53					

a. 2 cells (50.0%) have expected count less than 5. The minimum expected count is .34.

b. Computed only for a 2x2 table

c. The standardized statistic is -.646.

Association of systemic diseases and Candida colonization

Crosstab

Count

		candidaspp		
		no	yes	Total
prostatehyperplasia	no	27	24	51
	yes	1	1	2
Total		28	25	53

Chi-Square Tests

	Value	df	Asymptotic Significance (2-sided)	Exact Sig. (2-sided)	Exact Sig. (1-sided)	Point Probability
Pearson Chi-Square	.007[a]	1	.935	1.000	.726	
Continuity Correction[b]	.000	1	1.000			
Likelihood Ratio	.007	1	.935	1.000	.726	
Fisher's Exact Test				1.000	.726	
Linear-by-Linear Association	.007[c]	1	.935	1.000	.726	.508
N of Valid Cases	53					

a. 2 cells (50.0%) have expected count less than 5. The minimum expected count is .94.

b. Computed only for a 2x2 table

c. The standardized statistic is .081.

Association of systemic diseases and Candida colonization

Crosstab

Count

		nonalbicans		
		no	yes	Total
prostatehyperplasia	no	38	13	51
	yes	2	0	2
Total		40	13	53

Chi-Square Tests

	Value	df	Asymptotic Significance (2-sided)	Exact Sig. (2-sided)	Exact Sig. (1-sided)	Point Probability
Pearson Chi-Square	.675[a]	1	.411	1.000	.566	
Continuity Correction[b]	.000	1	1.000			
Likelihood Ratio	1.151	1	.283	.623	.566	
Fisher's Exact Test				1.000	.566	
Linear-by-Linear Association	.663[c]	1	.416	1.000	.566	.566
N of Valid Cases	53					

a. 2 cells (50.0%) have expected count less than 5. The minimum expected count is .49.

b. Computed only for a 2x2 table

c. The standardized statistic is -.814.

Association of systemic diseases and Candida colonization

Crosstab

Count

		multiplespecies		
		no	yes	Total
prostatehyperplasia	no	42	9	51
	yes	2	0	2
Total		44	9	53

Chi-Square Tests

	Value	df	Asymptotic Significance (2-sided)	Exact Sig. (2-sided)	Exact Sig. (1-sided)	Point Probability
Pearson Chi-Square	.425[a]	1	.514	1.000	.687	
Continuity Correction[b]	.000	1	1.000			
Likelihood Ratio	.760	1	.383	1.000	.687	
Fisher's Exact Test				1.000	.687	
Linear-by-Linear Association	.417[c]	1	.518	1.000	.687	.687
N of Valid Cases	53					

a. 2 cells (50.0%) have expected count less than 5. The minimum expected count is .34.

b. Computed only for a 2x2 table

c. The standardized statistic is -.646.

Association of systemic diseases and Candida colonization

Crosstab

Count

		candidaspp		
		no	yes	Total
spondylolisthesis	no	28	23	51
	yes	0	2	2
Total		28	25	53

Chi-Square Tests

	Value	df	Asymptotic Significance (2-sided)	Exact Sig. (2-sided)	Exact Sig. (1-sided)	Point Probability
Pearson Chi-Square	2.328[a]	1	.127	.218	.218	
Continuity Correction[b]	.646	1	.422			
Likelihood Ratio	3.094	1	.079	.218	.218	
Fisher's Exact Test				.218	.218	
Linear-by-Linear Association	2.284[c]	1	.131	.218	.218	.218
N of Valid Cases	53					

a. 2 cells (50.0%) have expected count less than 5. The minimum expected count is .94.

b. Computed only for a 2x2 table

c. The standardized statistic is 1.511.

Association of systemic diseases and Candida colonization

Crosstab

Count

		nonalbicans		
		no	yes	Total
spondylolisthesis	no	38	13	51
	yes	2	0	2
Total		40	13	53

Chi-Square Tests

	Value	df	Asymptotic Significance (2-sided)	Exact Sig. (2-sided)	Exact Sig. (1-sided)	Point Probability
Pearson Chi-Square	.675[a]	1	.411	1.000	.566	
Continuity Correction[b]	.000	1	1.000			
Likelihood Ratio	1.151	1	.283	.623	.566	
Fisher's Exact Test				1.000	.566	
Linear-by-Linear Association	.663[c]	1	.416	1.000	.566	.566
N of Valid Cases	53					

a. 2 cells (50.0%) have expected count less than 5. The minimum expected count is .49.

b. Computed only for a 2x2 table

c. The standardized statistic is -.814.

Association of systemic diseases and Candida colonization

Crosstab

Count

		multiplespecies		
		no	yes	Total
spondylolisthesis	no	42	9	51
	yes	2	0	2
Total		44	9	53

Chi-Square Tests

	Value	df	Asymptotic Significance (2-sided)	Exact Sig. (2-sided)	Exact Sig. (1-sided)	Point Probability
Pearson Chi-Square	.425[a]	1	.514	1.000	.687	
Continuity Correction[b]	.000	1	1.000			
Likelihood Ratio	.760	1	.383	1.000	.687	
Fisher's Exact Test				1.000	.687	
Linear-by-Linear Association	.417[c]	1	.518	1.000	.687	.687
N of Valid Cases	53					

a. 2 cells (50.0%) have expected count less than 5. The minimum expected count is .34.

b. Computed only for a 2x2 table

c. The standardized statistic is -.646.

Association of systemic diseases and Candida colonization

Crosstab

Count

		candidaspp		
		no	yes	Total
thyrotoxicosis	no	27	25	52
	yes	1	0	1
Total		28	25	53

Chi-Square Tests

	Value	df	Asymptotic Significance (2-sided)	Exact Sig. (2-sided)	Exact Sig. (1-sided)	Point Probability
Pearson Chi-Square	.910[a]	1	.340	1.000	.528	
Continuity Correction[b]	.000	1	1.000			
Likelihood Ratio	1.293	1	.255	1.000	.528	
Fisher's Exact Test				1.000	.528	
Linear-by-Linear Association	.893[c]	1	.345	1.000	.528	.528
N of Valid Cases	53					

a. 2 cells (50.0%) have expected count less than 5. The minimum expected count is .47.

b. Computed only for a 2x2 table

c. The standardized statistic is -.945.

Association of systemic diseases and Candida colonization

Crosstab

Count

		nonalbicans		
		no	yes	Total
thyrotoxicosis	no	39	13	52
	yes	1	0	1
Total		40	13	53

Chi-Square Tests

	Value	df	Asymptotic Significance (2-sided)	Exact Sig. (2-sided)	Exact Sig. (1-sided)	Point Probability
Pearson Chi-Square	.331[a]	1	.565	1.000	.755	
Continuity Correction[b]	.000	1	1.000			
Likelihood Ratio	.569	1	.451	1.000	.755	
Fisher's Exact Test				1.000	.755	
Linear-by-Linear Association	.325[c]	1	.569	1.000	.755	.755
N of Valid Cases	53					

a. 2 cells (50.0%) have expected count less than 5. The minimum expected count is .25.

b. Computed only for a 2x2 table

c. The standardized statistic is -.570.

Association of systemic diseases and Candida colonization

Crosstab

Count

		multiplespecies		
		no	yes	Total
thyrotoxicosis	no	43	9	52
	yes	1	0	1
Total		44	9	53

Chi-Square Tests

	Value	df	Asymptotic Significance (2-sided)	Exact Sig. (2-sided)	Exact Sig. (1-sided)	Point Probability
Pearson Chi-Square	.208[a]	1	.648	1.000	.830	
Continuity Correction[b]	.000	1	1.000			
Likelihood Ratio	.376	1	.540	1.000	.830	
Fisher's Exact Test				1.000	.830	
Linear-by-Linear Association	.205[c]	1	.651	1.000	.830	.830
N of Valid Cases	53					

a. 2 cells (50.0%) have expected count less than 5. The minimum expected count is .17.

b. Computed only for a 2x2 table

c. The standardized statistic is -.452.

Association of systemic diseases and Candida colonization

Crosstab

Count

		candidaspp		
		no	yes	Total
Parkinson	no	27	24	51
	yes	1	1	2
Total		28	25	53

Chi-Square Tests

	Value	df	Asymptotic Significance (2-sided)	Exact Sig. (2-sided)	Exact Sig. (1-sided)	Point Probability
Pearson Chi-Square	.007[a]	1	.935	1.000	.726	
Continuity Correction[b]	.000	1	1.000			
Likelihood Ratio	.007	1	.935	1.000	.726	
Fisher's Exact Test				1.000	.726	
Linear-by-Linear Association	.007[c]	1	.935	1.000	.726	.508
N of Valid Cases	53					

a. 2 cells (50.0%) have expected count less than 5. The minimum expected count is .94.

b. Computed only for a 2x2 table

c. The standardized statistic is .081.

Association of systemic diseases and Candida colonization

Crosstab

Count

		nonalbicans		
		no	yes	Total
Parkinson	no	39	12	51
	yes	1	1	2
Total		40	13	53

Chi-Square Tests

	Value	df	Asymptotic Significance (2-sided)	Exact Sig. (2-sided)	Exact Sig. (1-sided)	Point Probability
Pearson Chi-Square	.728[a]	1	.393	.434	.434	
Continuity Correction[b]	.000	1	.987			
Likelihood Ratio	.629	1	.428	1.000	.434	
Fisher's Exact Test				.434	.434	
Linear-by-Linear Association	.715[c]	1	.398	.434	.434	.377
N of Valid Cases	53					

a. 2 cells (50.0%) have expected count less than 5. The minimum expected count is .49.

b. Computed only for a 2x2 table

c. The standardized statistic is .845.

Association of systemic diseases and Candida colonization

Crosstab

Count

		multiplespecies		
		no	yes	Total
Parkinson	no	43	8	51
	yes	1	1	2
Total		44	9	53

Chi-Square Tests

	Value	df	Asymptotic Significance (2-sided)	Exact Sig. (2-sided)	Exact Sig. (1-sided)	Point Probability
Pearson Chi-Square	1.607[a]	1	.205	.313	.313	
Continuity Correction[b]	.095	1	.758			
Likelihood Ratio	1.208	1	.272	.313	.313	
Fisher's Exact Test				.313	.313	
Linear-by-Linear Association	1.577[c]	1	.209	.313	.313	.287
N of Valid Cases	53					

a. 2 cells (50.0%) have expected count less than 5. The minimum expected count is .34.

b. Computed only for a 2x2 table

c. The standardized statistic is 1.256.

APPENDIX F Spearman's Correlation test

Correlations

			unstimflowrate	stimflowrate	logCFU
Spearman's rho	unstimflowrate	Correlation Coefficient	1.000	.707**	-.336*
		Sig. (2-tailed)	.	.000	.014
		N	53	53	53
	stimflowrate	Correlation Coefficient	.707**	1.000	-.436**
		Sig. (2-tailed)	.000	.	.001
		N	53	53	53
	logCFU	Correlation Coefficient	-.336*	-.436**	1.000
		Sig. (2-tailed)	.014	.001	.
		N	53	53	53

**. Correlation is significant at the 0.01 level (2-tailed).

*. Correlation is significant at the 0.05 level (2-tailed).

Correlations

			unstimflowrate	stimflowrate	GI	TCI	RCI
Spearman's rho	unstimflowrate	Correlation Coefficient	1.000	.707**	-.387**	-.271*	.069
		Sig. (2-tailed)	.	.000	.004	.049	.624
		N	53	53	53	53	53
	stimflowrate	Correlation Coefficient	.707**	1.000	-.371**	-.359**	-.018
		Sig. (2-tailed)	.000	.	.006	.008	.896
		N	53	53	53	53	53
	GI	Correlation Coefficient	-.387**	-.371**	1.000	.298*	.108
		Sig. (2-tailed)	.004	.006	.	.030	.441
		N	53	53	53	53	53
	TCI	Correlation Coefficient	-.271*	-.359**	.298*	1.000	.249
		Sig. (2-tailed)	.049	.008	.030	.	.073
		N	53	53	53	53	53
	RCI	Correlation Coefficient	.069	-.018	.108	.249	1.000
		Sig. (2-tailed)	.624	.896	.441	.073	.
		N	53	53	53	53	53

**. Correlation is significant at the 0.01 level (2-tailed).

*. Correlation is significant at the 0.05 level (2-tailed).

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