

# SALIVARY PROFILE AND IDENTIFICATION OF EXISTING CANDIDA sp OF AN INSTITUTIONALIZED ELDERLY POPULATION IN JAKARTA

(PROFIL SALIVA DAN IDENTIFIKASI KEBERADAAN CANDIDA sp PADA LANSIA DI PANTI JOMPO DI JAKARTA)

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## Abstract

Saliva plays an important role to protect oral and dental health, in maintenance oral microflora balance. In elderly, disease, and medications usually influence the saliva. The purpose of this preliminary study was to investigate salivary profile, oral symptoms of dryness, and existing of *Candida sp* of an institutionalized elderly in Jakarta, Twenty seven (27) elderly (17 men and 10 women) were examined in a cross sectional study. Unstimulated whole saliva was collected for 5 minutes, according to published protocol, and then salivary flow rate and pH were measured. *Candida sp* were cultured in CHROM agar. The yeasts were counted and identified. Oral symptom or complaints of oral dryness, and burning or itching were recorded with an interview. Data of systemic conditions and medication the used were obtained from the medical record. Eighteen (66.7%) CHROM agar plates were *Candida sp* positive cultured, and about 61.1% subjects' salivary pH were below normal range. Twenty one (77.8%) subjects had oral symptom and complain about oral dryness, even though the salivary flow rate were in normal range. In this study, *C.albicans* is not the most frequently found colonized. About 72% were identified not *C.albicans*. This study suggests that, in elderly which salivary pH was below normal range have greater opportunistic infected by *Candida sp*. It can be concluded that, the result did not confirm a significant difference between subjects' data and salivary profile concentration. The mycological finding *Candida albicans* is not the most frequently found colonized in this elderly population. Further study which lagger elderly population and might give deeper insights of salivary profile in this population.

**Key words:** salivary flow rate, salivary pH, *Candida sp*

## Abstrak

Saliva memiliki peranan penting dalam melindungi kesehatan rongga mulut dan gigi, dalam hal menjaga keseimbangan mikro flora oral. Pada orang lanjut usia, penyakit dan pengobatan biasanya mempengaruhi saliva. Tujuan studi ini adalah untuk menginvestigasi profil saliva, gejala kekeringan oral, dan adanya *Candida sp* di suatu institusi lansia di Jakarta, Indonesia. Dus puluh tujuh (27) orang lansia (17 pria dan 17 wanita) di periksa pada studi *cross sectional*. Saliva tanpa stimulasi dikumpulkan selama 5 menit, sesuai dengan protokol, dan kemudian rerata laju saliva dan pH saliva diukur. *Candida sp* dikultur di CHROM agar. Yeasts yang ada dihitung dan diidentifikasi. Gejala oral ataupun keluhan terhadap mulut kering dan rasa terbakar atau gatal direkam dalam suatu wawancara. Data kondisi sistemik dan riwayat kesehatan diperoleh dari rekam medis. Delapan belas (66,7%) agar CHROM positif candida sp dan sekitar 61,1% pH saliva subjek dibawah batas normal. Dua puluh satu (77,8%) subjek memiliki gejala dan keluhan mulut kering walaupun rerata laju salivanya dalam batas normal. Pada studi ini, *C.albicans* bukanlah koloni bakteri yang paling anyak dijumpai. Sekitar 72% bakteri yang teridentifikasi bukan *C.albicans*. Pada studi ini menemukan pada lansia dengan pH saliva dibawah normal memiliki kemungkinan yang lebih tinggi terinfeksi oleh *Candida sp*. Penelitian lebih lanjut dengan populasi yang lebih besar dan mungkin dapat memberikan gambaran profil saliva yang lebih dalam pada populasi ini.

**Kata kunci:** rerata laju saliva, pH saliva, *Candida sp*

## INTRODUCTION

Among countries worldwide, developing countries

are facing the fastest growth of elderly population.<sup>1</sup> Health maintenance of this population is a very important issue for these countries, since changing in

disease pattern would be expected. Indonesia as a country in the fifth largest population would need to pay more attention on the burden of chronic diseases and related impacts in elderly quality of life. Oral health status of elderly would also have impacts in general health and quality of life.

Saliva is a key in oral homeostasis. It is important to maintain oral and dental health, due to its organic and anorganic component. Saliva plays an important role in maintenance oral microflora balance. In old age, disease, and using medication usually influence saliva. Therefore, its alteration in terms of quantity, quality and composition would interfere oral homeostasis.<sup>2</sup> Several studies have included in salivary flow rate, pH and buffering capacity to assess salivary function and determine salivary profile.<sup>3,4</sup> The changing in salivary profile in elderly may influence capability in maintaining oral microflora balance. This condition may give different profile of microflora of oral cavity, which is responsible to the type of infection happened in this population. *Candida sp* is a normal microflora in oral cavity. There is individual level of *Candida* carriage that is correlated with age and general health condition. Risk of candida infection is increased in parallel with age. *Candida sp* is the common causative agent of fungal infection in oral cavity with *Candida albicans* is the most common species involved. Opportunistic infection caused by *Candida sp* is one of the infection that may be caused by the changing of salivary profile in elderly. Other risk factor of this infection includes high usage of dentures in the elderly population that may become a reservoir for *Candida sp*. However, it is not known whether *Candida albicans* is still the causative agent of the presence of fungal infection in elderly.<sup>5</sup>

To date, data on the condition of salivary profile and its relation to the status of *Candida sp* in elderly population in Indonesia is still not well documented. The objective of this research was to investigate salivary profile (protein concentration, salivary flow rate, and pH), oral symptoms of dryness, and existing of *Candida sp* in an institutionalized elderly population in Jakarta, Indonesia. This study would provide additional information regarding to elderly in Indonesia.

## MATERIALS AND METHODS

Twenty-seven elderly (17 men and 10 women) were examined in a cross sectional study. Approval to undertake this study was obtained from the Institutional Ethics Committee of Faculty of Dentistry Universitas Indonesia, and informed consent was obtained from all subjects. We also interviewed their

complaints of oral dryness and burning sensation or itching. Single unstimulated whole saliva sample was collected from each subject for 5 minutes, according to published protocol, and then salivary flow rate and pH were measured.

All of saliva samples were kept on ice during collecting. The collected specimens were soon centrifuged at 4600 rpm for 5 minutes in 4°C to remove microorganisms, and desquamated epithelial cells. The supernatants and pellets were kept in -20°C until used for analysis. The supernatants were used to analyze total saliva concentration from each sample, and were calculated using Bradford method. Then the pellet was diluted using 5 ml PBS, and *Candida sp* were cultured in specific culture media, CHROM agar by taking 50 µl diluted pellet, incubated in 37°C, for 48 hours. The characterization of *Candida sp* was carried out by isolation in CHRO Magar, a sensitive and specific method for presumptive identification of yeast species, most commonly used for *Candida sp*. The yeasts were counted and identified. The presence of oral symptom or complain of oral dryness, and burning or itching was recorded with an interview. Data of systemic condition and medication their used were obtained from the medical record.

## RESULT

The study involved 27 elderly, of whom 17 men and 10 women. The characteristic of the subjects was described in Table 1. This demographic data obtained from anamnesis and confirmed the patient's medical record books, which was then recorded in research examination sheet. Based on gender, 63% of the subjects were male, and all subjects were over 60 years old, with the highest age range 60-65 years (55.5%).

We identified subjects with oral dryness's complain by interview. Twenty-one (77.8%) subjects had oral complaints about oral dryness (non xerostomia), and 6 (22.2%) subjects had no oral complaints of dryness (xerostomia). The mean of unstimulated salivary flow rate was  $1.78 \pm 0.424$  ml/m and 6 (22.2%) elderly classified hyposalivation, while 21 (77.8%) subjects had normal salivary flow rate (Figure 1).

Twenty-two (81.5%) subjects had salivary acidic pH, and only about 5 (18.5%) who were at normal pH range (Figure 2). In elderly, which salivary pH were below normal range had greater opportunistic infected by *Candida sp*.

Salivary profile of study subjects were in the range of very varied, with the mean concentration of total salivary protein in this population was 1369 µg/ml

(SD  $\pm$  669.6) (Figure 3). Salivary profiles of study subjects were not significantly related to the presence of *Candida sp.* Furthermore, subjects' data on age, sex, salivary flow rate and salivary pH did not significantly influence the total salivary protein concentration.

Table 1. Characteristic of elderly based on gender, age, education, systemic diseases, smoking habit, salivary flow rate, and saliva pH.

Characteristic of subjects	n	%
Gender		
Male	17	63
Female	10	37
Age (year)		
60-65	15	55.5
66-71	3	11.1
72-76	4	14.8
77-81	3	11.1
82-86	1	3.7
87-91	1	3.7
Education		
No formal education	4	14.8
Primary	10	37
Junior high	7	25.9
Senior high	4	14.8
Academy	2	7.4
University	0	0
Systemic diseases		
Yes	20	74
No	7	26
Smoking		
Yes	18	66.7
No	9	33.3

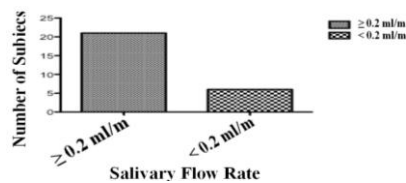


Figure 1. Distribution of subjects' salivary flow rate

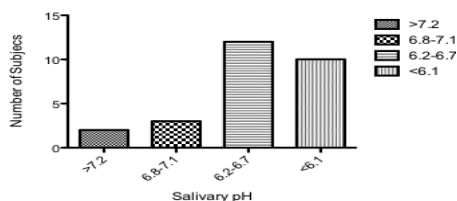


Figure 2. Distribution of subjects' salivary pH

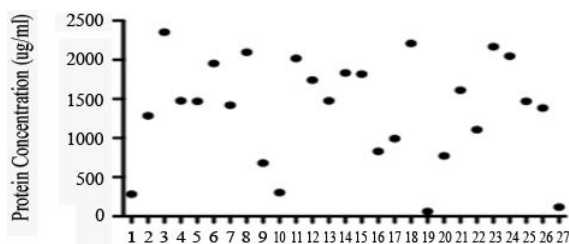


Figure 3. Distribution of total salivary protein concentration

A total of 27 isolates were screened for their abilities to grow and for their colony colors in CHROM agar (Figure 4).

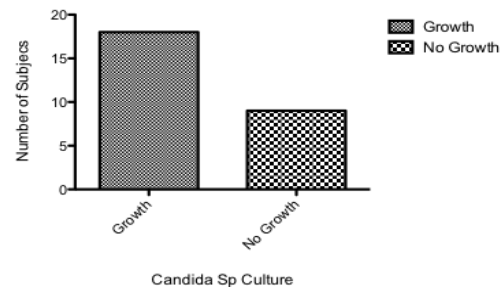


Figure 4. Presence of *Candida sp* culture

Eighteen (66.7%) CHROM agar plates was *Candida sp* positive culture. In this study, *Candida albicans* the most frequently found colonized. It was observed only 7 (38.9%) of culture *Candida albicans*' positive, which is determined based on colony color. About 11 (61.1%) were identified not *Candida albicans*. *Candida tropicalis* had been found in 6 (54.5%) subjects, and the remaint, 5 (45.5%) subjects were identified as the growth of *Candida krusei*'s yeast.

## DISCUSSION

The analysis of our data showed that eighteen (66.7%) subjects with a positive culture of *Candida sp*, and about 61.1% subjects of salivary pH were below normal range. But there was us tendency of influence of salivary flow rate. The prevalence of xerostomia increases with age, and it is approximately 30% of 65 years and older.<sup>2</sup> There are some controversies about salivary flow rate changes in elderly. Some previous research showed that there were tendencies of changes, but some research showed that the relationship about aging and salivary flow rate change.<sup>6</sup> In this present study, only 6 (22.2%) subjects with hyposalivation. This condition may have happen, because the age of whole subjects of this research dominantly in early elderly, 60-65 years old. A Continuous salivary flow is an important thing to protect oral environment from infection. In healthy elderly the unstimulated whole saliva rate exceeds 0.2ml/minutes. Based on the result of sialometry, about 21 (77.8%) subject had normal salivary flow rate. Twenty-one (77.8%) subjects was had oral symptom and complaint about oral dryness, eventhough salivary flow rate was in normal range. This may be due to a lot of subjects aged less than 65 years, so that the salivary glands still functioning properly. Complaint of dry mouth may be simply due to the lack of drinking water.

In elderly, systemic diseases, such as Diabetes mellitus and also malnutrition can also be a predisposing factor to candidiasis.<sup>7</sup> Beside, the medicine used to treat systemic diseases could change the local factors in saliva. It has been determined that the principal control of salivary secretion is mediated by innervations. The medicine used could influence salivary glands either through nerve system or directly to the glands. In this study there were no correlations between systemic disease and salivary glands. This may be caused by drugs used instead of xerogenic agents. Besides, there is no detail data about systemic health status. Subjects usually come to the local clinic in their institution for some medication to relief their subjective health complain. The health cares and general doctor have done the general and screening examination about their health problems. In our investigation, we only found symptomatic therapy and multivitamins given by there without specific examination, written down in their medical status. According to this situation, the definitive diagnosis of systemic diseases could not be declared, only by the review of system of each subject. Subjects with hyposalivation had no specific systemic disorder, but it is interesting, about 66.7% of the subject were smokers. Smoking can cause dry mouth, but in this present study, only six subjects had hyposalivation. Smoking can lead oral epithelial alteration to help colonization of *Candida sp*, and all of smokers in this study had positive *Candida* culture.<sup>8</sup>

The risk of *Candida* infection is increased in elderly. Kleinegger et al reported that *Candida albicans* was a predominant species in elderly population.<sup>9</sup> Lund GR also reported that *Candida albicans* is the most isolated species from oral cavity of patients more than 60 years old.<sup>10</sup> But in this present study we observed *non-albicans Candida* dominantly found in this population, and *Candida alibicans* only found in less than 40% subjects. A crescent frequently of *non-albican Candida* species has been reported in the last decade. In this study 55.6% had *C.tropicalis*. It had been documented that *tropical Candida* was found as the second most common isolated from betel quit chewers in Cambodian. Approximately 66% of our subjects were cigarette-smokers. Oral environment of cigarette-smokers may give contribution to the development *Candida sp*. Hence until now there is no significant data about this relation.<sup>11</sup> About 44.4% subjects with positive *Candida's* culture showed the growth of *Candida krusei*. Samaranyake stated that *Candida krusei* had been found in HIV/AIDS patients dominantly Thailand. Reichart et al found oral carriage of *Candida krusei* in there surveillance study

were in Leprosy patients in Northern Thailand.<sup>12</sup> We could not predict the relation between the growth of *Candida krusei* and subjects systemic condition in this present study, because there was no diagnosis clarification of systemic diseases in medical records, and only the subjective complaints without specific objective examination. It can to concluded that, the result did not confirm a significant difference between subjects' data and salivary profile concentration. The mycological finding *Candida albicans* is not the most frequently found colonized in this elderly population. Further study which includes bigger elderly population required to confirm this result, and might give deeper insights of salivary profile in this population.

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