B-ICON Proceeding

IDENTIFICATION OF CANDIDA SPECIES IN THE SALIVA OF ELDERLY INDIVIDUALS WITH DIABETES MELLITUS IN THE WORKING AREA OF TELAGA DEWA PUBLIC HEALTH CENTER, BENGKULU CITY

Vivanelia, Sahidan[*], Heru Laksono, Pemi Perisnawati

Department of Medical Laboratory Technology, Poltekkes Kemenkes Bengkulu, Bengkulu, Indonesia

*Correspondent: sahidan_labor@yahoo.com

Abstract

Diabetes mellitus (DM) is a metabolic disorder characterized by high blood glucose levels resulting from insulin deficiency or resistance. This metabolic disorder may result in multiple complications, including fungal infections such as oral candidiasis. Elevated glucose concentrations in the saliva of individuals with diabetes mellitus create conditions favorable for the proliferation of Candida species, particularly among elderly patients with compromised immune function. The objective of this study was to assess the prevalence of Candida species in the saliva of 32 elderly patients with diabetes mellitus in the Telaga Dewa Public Health Center area of Bengkulu City. Descriptive research was employed to determine the prevalence of Candida species in the saliva of elderly patients with diabetes mellitus. Samples were collected using the absorption method with swabs, then examined macroscopically on Saboraud Dextrose Agar and microscopically with Lactophenol Cotton Blue staining. The results found positive results for Candida sp. in saliva in 25 individuals (78%), while 7 Individuals (22%) tested negative.

Keywords: Candida sp., Saliva, Elderly

INTRODUCTION

Diabetes mellitus is a metabolic disorder characterized by high blood sugar levels, resulting from either a lack of insulin or insulin insensitivity. Insulin is a hormone produced in the β cells of the pancreas, playing a crucial role in regulating blood sugar levels by controlling the use and storage of glucose. Insulin resistance means the body has difficulty using glucose because insulin does not work properly in target cells such as muscle, adipose tissue, and liver (Hardianto, 2020). In 2021, the International Diabetes Federation (IDF) reported that 537 million people worldwide, aged 20 to 79 years, were diagnosed with diabetes mellitus. Furthermore, diabetes mellitus was responsible for one death every five seconds, accounting for approximately 6.7 million deaths globally. Indonesia ranks fifth among countries with the highest number of diabetes cases.

Impaired carbohydrate metabolism causes diabetes mellitus, which is characterized by high blood glucose levels, which can also increase salivary glucose levels. Saliva with high sugar content can encourage the growth of Candida sp. One of the mouth's primary defense mechanisms, saliva, has instructive elements that can be exploited as an indicator of human disease. Saliva contains substances that not only maintain the health of oral tissues but also provide clues to systemic and local diseases (Suraini & Sophia, 2023). Candida infections are currently a hot topic due to the increasing number of infections in immunocompromised patients. Candida can be found on the skin, oropharyngeal mucosa, gastrointestinal tract, and vagina. If the balance of a person's normal flora is disrupted, this commensal Candida can become pathogenic (Suyanto et al., 2019).

Fungal infections from the Candida sp. species cause oral candidiasis, also known as thrush, which is an infection of the oral cavity (Rezeki & Rahmayanti, 2023). A weakened immune system, such as in patients with HIV and diabetes mellitus, the use of unclean dentures, the effects of radiation therapy, medication use (including corticosteroids, antiepileptic drugs, allopurinol, sulfonamides, and antibiotics), and poor oral hygiene are risk factors and predisposing factors for oral candidiasis (Sari et al., 2022).

Elderly people are at greater risk of health problems due to a weakened immune system, making them more susceptible to microbial infections, especially fungal infections (Marisa & Mulyana, 2020). The growth of Candida sp. in the elderly is due to a reduction in daily activities and poor personal hygiene (Rusu et al., 2021). The Bengkulu City Health Office reported that in 2023, there were 3,746 individuals diagnosed with diabetes mellitus in Bengkulu City. Among all community health centers, the Telaga Dewa Community Health Center recorded the highest number of diabetes mellitus cases, with a total of 308 patients (Bengkulu City Health Office, 2023).

Based on the background and problems mentioned above, the author is interested in determining the presence of Candida sp. fungi in the saliva of elderly people with diabetes mellitus. Therefore, the researcher was motivated to conduct a study entitled "Identification of Candida sp. Fungi in the Saliva of Elderly People with Diabetes Mellitus in the Telaga Dewa Community Health Center Work Area in 2025."

METHODS

This study used a descriptive research design. The purpose of this study was to determine the presence or absence of Candida sp. in the saliva of elderly people with Diabetes Mellitus in the Telaga Dewa Community Health Center work area in 2025. The variable in this study was Candida sp. in the saliva of elderly people with Diabetes Mellitus. The study population consisted of elderly

people with diabetes at the Telaga Dewa Community Health Center. From January to August 2024, the population of elderly people with diabetes was 32. The sample was drawn using accidental sampling, a sampling methodology that involves selecting respondents who happened to be in a location relevant to the study.

The study was conducted at the Telaga Dewa Community Health Center, where the samples were collected, and the Bengkulu Ministry of Health's Polytechnic of Health laboratory will be used for sample analysis. The study will be conducted from November 2024 to May 2025. This study used primary data collection techniques. Primary data were obtained based on the results of macroscopic and microscopic examinations of Candida sp. identification. Data were collected from all research findings.

Laboratory examinations go through pre-analytical, analytical, and post-analytical stages. The pre-analytical stage involves patient preparation (informed consent) and saliva collection using sterile swabs, equipment and materials preparation, and work preparation (equipment sterilization and preparation of Saboraud Dextrose Agar). The analytical stage involves inoculating saliva samples onto SDA media using a streak plate and incubating them at 37ºC for 24-48 hours. Macroscopic observation of suspected Candida sp. colonies on SDA media is then performed. Microscopic examination is continued by preparing wet mounts stained with Lactophenol Cotton Blue. Identification is performed by observing structural characteristics such as blastopores (yeast cells), pseudohyphae, chlamydospores, and true hyphae.

This study used univariate or descriptive analysis to determine the presence of Candida sp. in the saliva of elderly people with diabetes mellitus. The results are described descriptively and interpreted based on percentage values.

RESULTS AND DISCUSSION

Results

After the data was processed and collected, the data was analyzed univariately to observe the frequency distribution of Candida sp in the saliva of Diabetes Mellitus patients in the Telaga Dewa Community Health Center Work Area, Bengkulu City, in 2025. The research results were as follows:

Table 1. Frequency Distribution of Candida sp. in the Saliva of Elderly People
with Diabetes Mellitus at Telaga Dewa Community Health Center.

Result	Frequency (n)	Percentage (%)
Positive (+)	25	78%
Negative (–)	7	22%
Total	32	100%

Table 1 shows that 25 elderly people with diabetes mellitus (78%) tested positive for Candida sp. Among these, Candida albicans was identified in 24 samples and Candida glabrata in one sample, all collected from patients at the Telaga Dewa Community Health Center. Table 1 shows that 25 elderly people with diabetes mellitus (78%) tested positive for Candida sp. Among these, Candida albicans was identified in 24 samples and Candida glabrata in one sample, all collected from patients at the Telaga Dewa Community Health Center.

Table 2. Distribution of Toothbrushing Habits in Relation to *Candida* sp. Examination Results.

Toothbrushing Frequency	Candida sp.				Total	
	Positive		Negative			
	n	%	n	%	n	%
0 times	4	100	0	0	4	100
1 time	4	100	0	0	4	100
2 times	12	71	5	29	17	100
3 times	5	71	2	29	7	100
Total	25		7		32	100

Table 2. presents the presence of *Candida* species in the saliva of elderly individuals with diabetes mellitus based on their toothbrushing habits. It can be observed that all four respondents who did not brush their teeth daily tested positive (100%) for *Candida* sp. Similarly, all four respondents who brushed their teeth once daily also tested positive (100%). Among the group who brushed twice daily (17 respondents), 12 (71%) tested positive and 5 (29%) tested negative. Meanwhile, in the group who brushed three times daily (7 respondents), 5 (71%) tested positive and 2 (29%) tested negative.

Table 3. Distribution of the Effect of Cigarette Use on Candida sp. Test Results

| cigarette use | Candida sp. | | | | Total | |
| | Positive | | Negative | | | |
	n	%	n	%	n	%
Yes	6	86	1	14	7	100
No	19	76	6	24	25	100
Total	25		7		32	100

Based on Table 3, it can be described that of the 7 smokers, 86% (6 people) tested positive for Candida sp. and 14% (1 person) tested negative. Meanwhile, of the 25 nonsmokers, 76% (19 people) tested positive and 24% (6 people) tested negative.

Table 4. Distribution of Denture Use and Examination Results Candida sp.

| Use of Dentures | Candida sp. | | | | Total | |
| | Positive | | Negative | | | |
	n	%	n	%	n	%
Yes	3	75	1	25	4	100

| Use of Dentures | Candida sp. | | | | Total | |
	Positive		Negative			
No	22	79	6	21	28	100
Total	25		7		32	100

Based on Table 4, it can be explained that 3 (75%) of the 4 respondents who used dentures were mostly positive. Meanwhile, almost all of the patients who did not use dentures received positive results, namely 25 people (79%). Almost all of the patients who used dentures received positive results, namely 25 people (79%).

DISCUSSION

The percentage of Candida sp. in elderly people with diabetes mellitus in the Telaga Dewa Community Health Center (Puskesmas) work area showed that almost all respondents (25 people) (78%) tested positive for Candida sp. in their saliva, while a small number (7 samples) (22%) tested

negative. This prevalence value indicates that of the total sample of elderly people with diabetes, the majority had Candida sp. in their saliva.

Furthermore, research by Triani et al. (2023) also supports these findings, where DM patients with poor glycemic control showed positive results for Candida albicans colonies in saliva. This suggests that the more uncontrolled blood sugar levels are, the greater the risk of fungal colonization in saliva. Changes in insulin release and glucose metabolism are influenced by aging. The majority of DM cases occur in the elderly because, in addition to physical weakness (without disease), aging causes a decline in physiological and metabolic abilities (Rif'at et al., 2023).

Of the 25 samples positive for Candida sp., almost all were Candida albicans (24 samples (96%), and a small proportion were Candida glabrata (1 sample (4%). C. albicans was found to be more dominant in the oral cavity due to its significantly greater ability to adhere to surfaces compared to other Candida species. This suggests that Candida albicans is more dominant in saliva due to its superior adhesion, which may increase its virulence and contribute to the pathogenesis of oral infections in diabetic patients (Silva et al., 2019). Of the group of respondents who never brushed their teeth, four (100%) tested positive for Candida. Meanwhile, in the group who brushed their teeth once a day, four (100%) tested positive for Candida sp. in their saliva. Twelve (71%) tested positive in the group who brushed their teeth twice a day. Five (71%) also tested positive in the group who brushed their teeth three times a day. Although brushing your teeth 2-3 times a day is considered a good habit and meets health standards, the percentage of positive Candida sp. in the saliva of both groups was high.

Research conducted by Geni et al. (2020) found that the prevalence of Candida sp. remained high in the group that brushed their teeth more than once. This is likely influenced by other factors, such as improper brushing technique. Furthermore, adherence to brushing also plays a predisposing factor in increasing Candida counts. Four elderly respondents who did not brush their teeth stated that they did not do so because they no longer had teeth. Elderly people without teeth should rinse their mouths after every meal and carefully brush their tongue and gums with a soft toothbrush or cloth to remove any food debris, minimizing oral candidiasis (Bintari et al., 2020).

Based on cigarette use, 6 (86%) of the smoking group tested positive for Candida sp. Meanwhile, non-smoking respondents also tested positive (76%). Candida colonization increases in smokers due to reduced oral polymorphonuclear leukocyte activity. Furthermore, smoking reduces gingival crevicular fluid, which carries antibodies and immune cells (Patel, 2022). In the denture-wearing group, 3 individuals (75%) tested positive, while in the denture-free group, 22 individuals (79%) also tested positive. The risk of Candida infection is indeed higher in denture wearers because changes in

the local oral environment, such as a decrease in pH, can trigger the growth of commensal Candida (Benyounes et al., 2024). Uncontrolled blood glucose levels are a major factor significantly associated with the occurrence of oral candidiasis in patients with diabetes mellitus (Bayu et al., 2022). Although oral hygiene remains important, oral hygiene is only a predisposing factor compared to major systemic factors such as aging and underlying diseases like diabetes (Geni et al., 2020).

CONCLUSION

Based on the results of research and discussions on the identification of Candida sp. in the saliva of elderly people with diabetes mellitus in the Telaga Dewa Community Health Center, Bengkulu City, in 2025, almost all respondents (78%) tested positive for Candida sp. in saliva, and almost half (22%) tested negative for Candida sp., out of a total of 32 samples

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