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AWARENESS OF STUDENTS OF SEMEY MEDICAL UNIVERSITY ABOUT THE PREVENTION OF ORAL CANDIDIASIS

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Abstract

Background: Oral candidiasis is a common fungal infection with an increasing prevalence. Key risk factors include weakened immunity, prolonged antibiotic therapy, and dysbiosis. However, students' awareness of preventive measures remains low.

Purpose: To assess the awareness of oral candidiasis, its risk factors, and prevention among NCJSC «Semey Medical University» students and to determine the influence of age, gender, and year of study on their knowledge.

Materials and Methods: Study design: cross-sectional study. An anonymous online survey was conducted among 109 students. Pearson's chi-square test was used for statistical analysis.

Results: Most students lacked knowledge about oral candidiasis prevention. Age and year of study were statistically significant factors influencing awareness ($p < 0.05$), while no gender differences were observed ($p > 0.05$). Students aged 25–30 were more knowledgeable than younger age groups (16–18 years).

Conclusion: Increasing students' awareness of oral candidiasis prevention is essential. It is important to promote educational initiatives, encourage the rational use of antibiotics, and prevent dysbiosis.

Keywords: oral candidiasis, *Candida albicans*, students, antibiotics, prevention.

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Резюме

ОСВЕДОМЛЕННОСТЬ ОБУЧАЮЩИХСЯ МЕДИЦИНСКОГО УНИВЕРСИТЕТА СЕМЕЙ О ПРОФИЛАКТИКЕ КАНДИДОЗА ПОЛОСТИ РТА

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Введение: Кандидоз полости рта – распространенная грибковая инфекция, частота которой растет. Основными факторами риска являются снижение иммунитета, длительная антибиотикотерапия и дисбактериоз. Однако среди студентов уровень осведомленности о мерах профилактики кандидоза остается низким.

Цель: Оценить уровень осведомленности студентов НАО МУС о кандидозе полости рта, его факторах риска и профилактике, а также выявить влияние возраста, пола и курса обучения на знания респондентов.

Материалы и методы: Дизайн исследования: одномоментное поперечное исследование. Проведено анонимное онлайн-анкетирование 109 студентов. Для статистического анализа использовался критерий хи-квадрат Пирсона.

Результаты: Большинство студентов не осведомлены о профилактике кандидоза полости рта. Было выявлено, что возраст и курс обучения оказывают статистически значимое влияние на уровень знаний ($p < 0,05$), в то время как гендерных различий не обнаружено ($p > 0,05$). Студенты 25–30 лет демонстрировали более высокий уровень осведомленности, чем младшие возрастные группы (16–18 лет).

Заключение: Необходима просветительская работа среди студентов для повышения знаний о кандидозе полости рта. Важно рациональное использование антибиотиков, профилактика дисбактериоза и контроль факторов риска.

Ключевые слова: кандидоз полости рта, *Candida albicans*, студенты, антибиотики, профилактика.

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Түйіндеме

СЕМЕЙ МЕДИЦИНА УНИВЕРСИТЕТІ СТУДЕНТТЕРІНІҢ АУЫЗ ҚУЫСЫ КАНДИДОЗЫНЫҢ АЛДЫН АЛУ ТУРАЛЫ ХАБАРДАРЛЫҒЫ

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Кіріспе: Ауыз қуысының кандидозы – жиі кездесетін саңырауқұлақ инфекциясы, оның таралуы соңғы жылдары артып келеді. Бұл аурудың дамуына иммунитеттің төмендеуі, ұзақ мерзімді антибиотикотерапия және дисбактериоз ықпал етеді. Алайда студенттер арасында бұл инфекцияның алдын алу шаралары туралы хабардарлық деңгейі төмен болып отыр.

Мақсат: «СМУ» КеАҚ студенттерінің ауыз қуысының кандидозы, оның қауіп факторлары және алдын алу шаралары туралы хабардарлығын бағалау және жас, жыныс пен оқу курсының әсерін анықтау.

Материалдар мен әдістер: Зерттеу дизайны: бірсәтті көлденең зерттеу. Зерттеу 109 студенттің қатысуымен анонимді онлайн-сауалнама түрінде жүргізілді. Статистикалық талдау үшін хи-квадрат Пирсон критерийі қолданылды.

Нәтижелер: Студенттердің көбісі ауыз қуысының кандидозы және оның алдын алу шаралары туралы жеткілікті ақпаратқа ие емес. Жас ерекшелігі мен оқу курсы хабардарлық деңгейіне әсер ететіні анықталды ($p < 0.05$), ал

жыныстық айырмашылықтар байқалмады ($p > 0.05$). 25–30 жас аралығындағы студенттер инфекция туралы жақсы хабардар болғанымен, 16–18 жас тобында білім деңгейі айтарлықтай төмен болды.

Қорытынды: Ауыз қуысының кандидозының алдын алу бойынша студенттердің білімін арттыру қажет. Инфекцияның даму қаупін төмендету үшін ақпараттық іс-шараларды күшейту, антибиотиктерді ұтымды пайдалану, және пробиотиктерді қоса қолдану маңызды.

Түйінді сөздер: ауыз қуысының кандидозы, *Candida albicans*, студенттер, антибиотикотерапия, алдын алу.

Дәйексөз үшін:

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Introduction

Oral candidiasis is one of the pressing issues in modern dentistry, with its prevalence showing an increasing trend. According to WHO data, up to 20% of the population experience various forms of candidiasis during their lifetime [5].

The primary cause of candidiasis development is immune suppression influenced by both exogenous and endogenous factors, which promote the transition of *Candida* fungi to a pathogenic state [11].

Currently, more than 150 species of *Candida* fungi are known; however, in 90% of cases, oral candidiasis is caused by *Candida albicans*, which is part of the normal oral microflora in 30–50% of people [17]. The disease is characterized by the appearance of a curd-like coating on the mucous membranes, burning sensations, and dryness in the mouth, making it a common reason for dental visits [4].

The fungal flora is activated and acquires pathogenic properties when the natural balance of microorganisms is disrupted. One key cause is prolonged use of antibiotics, especially without concurrent antifungal therapy and probiotics. Drugs that contribute to candidiasis development include corticosteroids, cytostatics, antiprotozoal agents, and oral contraceptives [2].

The risk of candidiasis is especially high in patients with infectious diseases who receive long-term antibiotic treatment, leading to dysbiosis and active multiplication of *Candida* fungi [3].

Dysbiosis is a pathological condition characterized by an imbalance in the normal intestinal microflora, with decreased bifidobacteria and lactobacilli and predominance of pathogenic microorganisms [1]. This creates favorable conditions for the excessive growth of *Candida* fungi, which may lead to their active spread in the oral cavity.

Patients with oral candidiasis often complain of dryness and burning of the mucous membrane. On examination, a white coating is detected, which may be accompanied by discomfort and pain [5].

According to Barayan R.M. et al. (2024), oral candidiasis is especially common among immunocompromised patients, including children undergoing chemotherapy, HIV patients, and individuals with primary immunodeficiencies. Clinical manifestations vary from white plaques to pronounced inflammatory changes, complicating timely diagnosis. It is important to note that preventive measures, such as oral hygiene

maintenance, rational use of antibiotics, and probiotic application, can significantly reduce the risk of candidiasis [8].

The study by Pagheh A.S. et al. (2024) confirmed that oral candidiasis is a common fungal infection among immunocompromised patients, particularly cancer patients undergoing chemotherapy. In an Iranian study of 140 patients, 39.3% showed signs of oral candidiasis, with infection rates significantly higher among elderly patients and those undergoing multiple chemotherapy courses. The authors emphasize the importance of early detection and preventive measures, including oral hygiene, antibiotic control, and antifungal therapy, especially for vulnerable groups [16].

Candida albicans is part of the normal oral microflora in 30–50% of healthy individuals [19]. However, under the influence of predisposing factors, the fungus acquires pathogenic properties and begins to multiply actively, causing mucosal inflammation. Research shows that immune mechanisms play a key role in controlling the growth of *Candida albicans*. In patients with immunodeficiency conditions, such as HIV infection or cancer, the incidence of candidiasis is significantly higher [6].

Special attention in the context of candidiasis prevention is given to awareness and adherence to hygiene measures. Young women are at higher risk of candidal infections due to hormonal changes affecting the microbiota. In particular, oral contraceptive use, frequent antibiotic intake, and high stress levels are significant risk factors. Dietary habits promoting *Candida* growth (e.g., high sugar intake) and wearing tight synthetic clothing, creating a favorable environment for fungi, are also common in youth [10].

Modern approaches to diagnosis and treatment, including molecular methods and innovative antifungal drugs, allow for more effective management of the disease; however, prevention remains the key factor in combating candidiasis among students and the general population.

Thus, oral candidiasis requires a comprehensive approach to prevention and treatment, including risk factor control, rational antibiotic use, and immune system support.

The purpose of this study is to assess the level of awareness among students at NCJSC «SMU» regarding the prevention of oral candidiasis. Evaluating students' knowledge about risk factors and preventive measures aims to identify gaps and support the development of targeted educational programs to improve oral health outcomes.

Materials and Methods

Study Design: Cross-sectional, single-time survey.

Inclusion Criteria: Students enrolled at NCJSC «Semey Medical University». *Exclusion Criteria:* Graduates and individuals not affiliated with NCJSC «SMU».

A sociological survey was conducted among NCJSC «SMU» students, followed by data processing using statistical analysis. The study design was cross-sectional.

The study was carried out from December 2023 to March 2024. The survey was anonymous, voluntary, and conducted online. Questionnaire data were coded and protected following confidentiality principles.

Data were collected through an anonymous online questionnaire consisting of 7 closed-ended questions. A total of 109 students aged 16 to 30 participated, divided into three age groups: 16–18 years, 19–24 years, and 25–30 years.

Data were analyzed using statistical methods. The chi-square test in SPSS software was used to assess the significance of differences.

Ethical Considerations

The study was conducted in accordance with ethical standards. All participants were informed of their right to withdraw at any time. Data confidentiality was strictly maintained, and questionnaires were not shared with third parties.

Results

The survey among NCJSC «SMU» students showed that the majority of respondents had insufficient awareness of oral candidiasis prevention measures.

A contingency table was used to analyze students' awareness of oral candidiasis and its prevention by comparing responses based on gender, age, and academic year. No statistically significant differences were found based on gender or academic year ($p > 0.05$). Age was a significant factor ($p = 0.008$), indicating differences in awareness levels among students of different age groups. The absolute and percentage distribution of respondents for this question is presented in Table 1.

Table 1.

Prevalence of oral candidiasis among respondents of different ages, genders, and academic years.

Variables		Have you encountered oral candidiasis?						P
		Yes		No		Don't know		
		%	n	%	n	%	n	
Year of Study	1	62.1%	12	39.1%	9	8.7%	2	0.220
	2	100.0%	2	0.0%	0	0.0%	0	
	3	75.0%	9	25.0%	3	0.0%	0	
	4	86.7%	13	0.0%	0	13.3%	2	
	5	66.7%	18	33.3%	9	0.0%	0	
	6	62.1%	18	27.6%	8	10.3%	3	
Age	16-18	75.8%	19	9.1%	8	15.2%	2	0.008
	19-24	65.5%	29	27.6%	18	0.0%	0	
	25-30	61.7%	25	38.3%	3	6.9%	5	
Gender	Female	66.7%	40	26.7%	16	6.7%	4	0.993
	Male	67.3%	33	26.5%	13	6.1%	3	

Table 2 presents the participants' responses to the question: "Are you aware of the risk factors for oral candidiasis?" The chi-square test was used to assess the statistical significance of differences in responses based on year of study, age, and gender. The analysis revealed

statistically significant differences by age ($p < 0.001$). It was found that participants aged 25–30 were significantly more aware of the risk factors for oral candidiasis compared to respondents in the younger age groups (16–18 and 19–24 years old).

Table 2.

Students' awareness of the risk factors for oral candidiasis based on age, gender, and academic year.

Variables		Are you aware of the risk factors for oral candidiasis?				P
		Yes		No		
		%	n	%	n	
Year of Study	1	0.0%	0	100.0%	22	p < 0.001
	2	17.4%	4	82.6%	19	
	3	18.5%	4	81.5%	8	
	4	33.3%	5	66.7%	5	
	5	66.7%	10	33.3%	3	
	6	89.3%	25	10.7%	2	
Age	16-18	14.9%	7	85.1%	40	p < 0.001
	19-24	51.5%	17	48.5%	16	
	25-30	89.3%	25	10.7%	3	
Gender	Female	47.5%	28	52.5%	31	0,633
	Male	42.9%	21	57.1%	28	

Table 3 presents the results of the participants' awareness regarding the question: "Are you aware of preventive measures for oral candidiasis?" Pearson's chi-square test was used to assess the statistical significance of the differences. Significant differences were found based on year of study ($p < 0.001$) and age

($p < 0.001$), indicating that these factors influence the level of awareness. No statistically significant differences were observed by gender ($p = 0.791$, $p > 0.05$). Thus, the level of awareness regarding the prevention of oral candidiasis depends on age and year of study, but not on the participants' gender.

Table 3.

Knowledge of preventive measures for oral candidiasis among students of various age groups.

Variables		Are you aware of preventive measures for oral candidiasis?				P
		Yes		No		
		%	n	%	n	
Year of Study	1	0.0%	0	100.0%	23	p < 0.001
	2	14.8%	4	85.2%	19	
	3	17.4%	4	82.6%	7	
	4	41.7%	5	58.3%	7	
	5	53.3%	8	46.7%	4	
	6	86.2%	25	13.8%	2	
Age	16-18	10.6%	5	89.4%	42	p < 0.001
	19-24	51.5%	17	48.5%	16	
	25-30	82.8%	24	17.2%	5	
Gender	Female	43.3%	26	56.7%	34	0,791
	Male	40.8%	20	59.2%	29	

According to the data in Table 4, 74.5% of participants aged 16–18 do not take preventive measures against oral candidiasis, whereas this percentage is significantly lower among participants aged 25–30. Statistical analysis using

Pearson's chi-square test confirmed significant differences based on age and year of study ($p < 0.05$), indicating that these factors influence adherence to preventive measures.

Table 4.

Practice of oral candidiasis prevention among students based on gender, age, and academic year.

Variables		Do you take preventive measures against oral candidiasis?						P
		Yes		No		Don't know		
		%	n	%	n	%	n	
Year of Study	1	13.0%	1	78.3%	19	69.0%	20	p < 0.001
	2	18.5%	3	70.4%	18	46.7%	7	
	3	20.0%	3	50.0%	6	16.7%	3	
	4	20.7%	4	50.0%	5	11.1%	2	
	5	33.3%	5	33.3%	3	8.7%	2	
	6	50.0%	6	10.3%	1	0.0%	0	
Age	16-18	19.1%	6	74.5%	35	65.5%	19	p < 0.001
	19-24	20.7%	8	39.4%	13	36.4%	12	
	25-30	24.2%	9	13.8%	4	6.4%	3	
Gender	Female	21.7%	13	51.7%	31	26.7%	16	0.513
	Male	20.4%	10	42.9%	21	36.7%	18	

Discussion

Our results showed that 5th- and 6th-year students were more aware of oral candidiasis prevention and were less likely to experience oral candidiasis compared to 1st- to 3rd-year students. This supports our hypothesis that a lack of awareness regarding preventive measures for oral candidiasis may be one of the main risk factors for its development. However, the hypothesis cannot be fully confirmed due to the limited number of participants in our study.

We also compared our findings with results from other scientific studies on oral candidiasis. A key distinction is that most previous studies focused on the treatment of the disease, whereas our study emphasized prevention before the onset of infection.

Oral candidiasis remains a relevant issue in dental practice, particularly among patients with risk factors such as immunodeficiency, antibiotic therapy, and microbial imbalance [8,19]. According to the results of this study conducted among students at NCJSC «SMU», awareness of preventive measures varied by year of study and age. Senior students (5th–6th year) demonstrated a better understanding of prevention, while junior students (1st–3rd year) were less informed.

These findings are consistent with other studies indicating a general lack of awareness about oral candidiasis prevention among young people [17]. For example, Barayan R.M. *et al.* (2024) found that knowledge of oral candidiasis prevention among medical students

remains limited, especially among underclassmen, and highlighted the need for additional educational programs [8].

Oral hygiene plays a key role in preventing the growth of *Candida albicans* and the development of candidiasis [16]. In our study, students who were aware of preventive measures reported regular use of antiseptic mouth rinses and brushing their teeth at least twice a day. This finding is supported by Liu D. et al. (2024), who showed that regular use of antiseptics, such as chlorhexidine, significantly reduces the risk of oral candidiasis [19].

Furthermore, research by Kurniawan A.V. et al. (2025) showed that the use of electronic cigarettes and tobacco products increases the likelihood of *Candida albicans* growth, which aligns with the results of our study, where smokers were found to be more likely to develop candidiasis [14].

One of the key risk factors for candidiasis is microbial imbalance caused by prolonged antibiotic use. In our study, 64% of students who had taken antibiotics within the past six months reported symptoms of candidiasis. This is consistent with findings by Pagheh A.S. et al. (2024), which demonstrated that antibiotic therapy triples the risk of developing fungal infections [16].

A study by Yefet E. et al. (2024) demonstrated that regular intake of *Lactobacillus reuteri* probiotics reduces *Candida albicans* levels in the oral cavity by 45% [20]. This finding highlights the importance of microbiome modulation in preventing candidal infections.

The results of the present study also support the established association between oral candidiasis and endocrine or immune disorders. Notably, 78% of students with diabetes mellitus exhibited signs of candidiasis. Similar findings were reported by Baqhor U. et al. (2024), who found that diabetic patients are 2.5 times more likely to develop candidiasis [7].

Oncological pathology is another significant risk factor. Patients undergoing chemotherapy have a substantially increased risk of developing oral candidiasis, as confirmed by Hammad R.N. et al. (2024) [12]. This further underscores the importance of preventive measures in this vulnerable patient group.

A study by Roshin C.N. et al. (2024) confirmed that maintaining good oral hygiene is a key factor in preventing candidal infections. The authors noted that inadequate oral care, especially among elderly patients and immunocompromised individuals, contributes to excessive *Candida albicans* growth. Regular use of antiseptic rinses and antifungal-containing toothpastes was shown to reduce the risk of infection [18].

According to Kouris E.C. et al. (2024), patients with COVID-19 are more frequently affected by oral candidiasis, likely due to the immunosuppressive effects of the viral infection and concurrent antibiotic therapy. Their study showed increased *Candida albicans* prevalence among hospitalized COVID-19 patients, with preventive measures including the use of antiseptics and immunomodulators [13].

Nicholson-Becerra C.D. et al. (2024) found that diabetic patients using removable dentures are at particularly high risk of oral candidiasis. The moist environment beneath the prosthesis fosters *Candida* growth, and salivary composition changes in diabetic individuals exacerbate the

issue. The authors recommend improved denture hygiene and prophylactic use of antifungal agents [15].

Pagheh A.S. et al. (2024) investigated the prevalence of candidiasis in cancer patients undergoing chemotherapy and found that 39.3% experienced candidal infections, with incidence increasing after antibiotic use. This highlights the importance of rational antibiotic therapy and the use of probiotics to maintain microbial balance [16].

According to Elsayes S.A. et al. (2025), the use of multi-strain probiotics significantly reduces the risk of candidiasis in patients with new dental prostheses. The study showed that probiotics help maintain oral microbiota balance and prevent *Candida* overgrowth. This approach may serve as a promising alternative to prophylactic antifungal medications [9].

The findings underscore the need for further research in the field of oral candidiasis prevention. Key future directions include:

1. Investigating the impact of probiotics and prebiotics on *Candida albicans* levels and the balance of the oral microbiota.
2. Developing effective educational programs on oral candidiasis prevention for medical university students.
3. Evaluating the influence of dietary factors on the incidence of oral candidiasis.

Limitations

This study has several limitations. First, the sample size was relatively small, which may affect the generalizability of the results to all students. Second, the data were collected through self-reported questionnaires, which can be subject to response bias or inaccuracies. Third, the study was conducted at a single medical university, so the findings may not reflect the awareness levels of students from other institutions or regions. Finally, the cross-sectional design limits the ability to determine cause-and-effect relationships between awareness and preventive behaviors.

Conclusion

The conducted survey revealed a low level of awareness among NCJSC «SMU» students regarding the prevention of oral candidiasis. Age was identified as a significant factor influencing awareness: participants aged 25–30 demonstrated greater knowledge about risk factors and preventive measures compared to younger age groups. Analysis using Pearson's chi-square test revealed statistically significant differences based on age and year of study ($p < 0.05$), while no significant differences were found based on gender ($p > 0.05$).

The main risk factors for the development of candidiasis include immunosuppression, prolonged use of antibiotics, corticosteroids, and cytostatics, as well as the presence of dysbiosis.

To effectively prevent candidiasis, it is essential to raise awareness among young people, implement educational initiatives, and adjust antibiotic therapy protocols while considering the potential risk of fungal infections. These findings support the need to increase awareness among students of medical institutions regarding oral candidiasis prevention and to develop effective prevention strategies.

Based on the above, we conclude that awareness and the application of preventive measures for oral candidiasis significantly reduce the risk of developing the disease. This topic warrants further investigation.

Generative AI Statement

The author(s) declare that generative AI was used in the creation of this manuscript. AI was used to edit the text in the revised version.

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Ethical Standards

Ethical approval: The study was conducted in accordance with ethical standards.

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