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Assessment of the Severity of Depressive Symptoms in Patients over 65 Years of Age Using Removable Dentures

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Abstract

Background: *Depression is a common disorder among older adults, yet it is not a standard element of the aging process. Depression can affect oral health as a result of neglecting hygiene routines, poor nutrition, and avoiding necessary dental care, resulting in an increased risk of caries and periodontal disease. On the other hand, general health deteriorating with age and also poor oral health are not without their impact on mental state.*

Objectives: *The aim of this study was to assess the prevalence of depression and its association with oral problems in patients over 65 years of age using removable prosthetic restorations.*

Materials and methods: *Ninety-eight elderly patients (over 65 years of age) using removable prosthetic restorations were studied. The study variables included sociodemographic data (age, gender), and variables describing general health status included smoking and systemic diseases. The association of oral health parameters with depression was assessed using the following variables: missing teeth, duration of prosthetic restoration use, prosthetic inflammation, and dry mouth.*

Results: *Depression is significantly more frequently diagnosed among elderly patients (median age 72 years) with the evidence of a nervous system disease, denture wearers diagnosed with prosthetic ground inflammation, patients with dry mouth (according to the FOX test), and among patients using removable dentures for more than 10 years. Additionally, in the assessment of the risk of depression, age, cardiovascular disease, nervous system disease, duration of denture use of more than 10 years, prosthetic base inflammation and dry mouth according to the FOX test were found to statistically significantly increase the chance of developing depression.*

Conclusion: *The above data should be taken into account in the daily dental care of the elderly, and interdisciplinary care should be considered in elderly patients at risk of depression.*

Key words: *depression, removable dentures, dry mouth*

Introduction

The demographic ageing of the population of Europe, including Poland, is a progressive and irreversible process. It is forecasted that in the perspective of the coming decades this trend will continue or intensify, leading to a significant increase in the number of people over 65 years of age. These changes are associated with a growing number of persons suffering from age-related diseases. Multidirectional health changes, deterioration of physiological functions, reduced mental performance, increased susceptibility to stress cause many diseases to occur simultaneously.

Ageing is not only associated with the occurrence of somatic disorders. Physical deterioration, social isolation, loneliness, and lack of self-esteem are also common. Such a multitude of problems in elderly people often causes the occurrence of mental disorders, especially depression [1–3]. Progressive ageing is in itself one of the factors determining the occurrence of depressive disorders. Late-life depression (LLD) usually appears after the age of 65 and is a serious public health problem. It is estimated to occur in about 15–20% of people in this age group [1]. Studies conducted in Poland to assess the prevalence of depression among the elderly indicate that it occurs in 25% of the study population [4]. The PolSenior project (a publicly funded research project commissioned by the Ministry of Science and Higher Education to assess the health and social situation of older people in Poland) found that the incidence of depressive disorders increases with age (20% in the 55–59 age group, 25% in the 65–79 age group, and 33% in those aged 80 and over) [5].

Depression is a complex set of symptoms of emotional disorders, negatively influencing mood, motivation, way of thinking and acting. It often accompanies many other somatic complaints. Depressive state often overlaps with other illnesses, intensifying them andmaking their diagnosis or treatment more difficult. It contributes to worsening of the quality of life, which usually also deteriorates in old age. It can be as well a significant risk factor for other systemic diseases. Depression is often associated with bad

habits such as eating disorders, smoking and alcohol consumption. Loss of interest in daily activities can reduce concern for general health and thus oral health.

Depression as a mental health disorder is also often a predictor of many general health as well as oral health problems. On the other hand, general health deteriorating with age, the presence of many chronic diseases and often poor oral health that accompanies these changes are not without their impact on mental health.

As far as oral health status is concerned, depression is correlated with it. It is often associated with a lack of care for the condition and health of the oral cavity, avoidance of adequate dental care, fear of dental visits [6], poor hygiene, and subsequent advanced periodontal disease, extensive caries, and eventually tooth loss [7–10]. Depression is additionally accompanied by reduced salivary flow, often associated with the use of antidepressants, which are considered a group of drugs that can cause or exacerbate dry mouth and promote the development of carious bacteria [7]. Recent studies confirm the association of poor oral health due in large part to dysbiosis in the oral microflora caused by the aforementioned factors with anxiety and depressive behavior [8–11].

Unsatisfactory condition of oral cavity, caries, chronic inflammatory changes of periodontium, and loss of teeth impact the whole organism. Extensive missing teeth, incorrect occlusion, and problems in the use of prosthetic restorations may lead to difficulties in performing daily activities such as speaking or eating, which, in turn, may result in various limitations, discomfort, deterioration of the broadly defined quality of life, or even emotional disorders [12, 13].

Objectives

The aim of this study was to evaluate the association of oral health parameters with depression in patients over 65 years of age using removable prosthetic restorations.

Material and methods

The study was conducted on 98 elderly patients (over 65 years of age) using removable prosthetic devices who attended the General Dentistry Outpatient Clinic of the Medical University of Lodz, Institute of Dentistry in Lodz, for dental treatment. The study was approved by the Bioethics Committee of the Medical University of Lodz (RNN/340/18/KE).

Sociodemographic variables included age and gender. Patients were asked to rate their general health status. The presence of systemic diseases and medication intake were also recorded. Diseases were assigned to the cardiovascular, respiratory, gastrointestinal, and skeletal systems, and several groups of conditions were distinguished, such as diabetes, thyroid disease, nervous system disease, dementia, and depression. Addictions (smoking) were also considered in the study.

The study included questions concerning the time elapsed since the use of the first prostheses and the length of the use of the current prostheses. Patients were divided into 2 groups: those using dentures for up to 10 years vs those using dentures for over 10 years.

During physical examination, the dental status for missing teeth was assessed. Patients were divided into two groups: those with up to 10 missing teeth and those with more than 10 missing teeth.

In the group of patients using removable prosthetic restorations, the condition of the oral mucosa was assessed on physical examination according to the criteria of the Newton's classification, in which three degrees of inflammation are distinguished. For the purposes of the study, patients with active inflammation (in this case, patients with all inflammation classes) vs. patients without inflammation (class 0) were selected due to the small size of the groups with each inflammation class. As for the prosthetic treatment needs, the respondents were asked to subjectively assess such needs.

The assessment of dry mouth during the physical examination was based on the Fox et al. test. The test contains 10 questions on the quality of life of patients with reduced saliva production. Positive answers to the questions suggest the presence of dry mouth. Answering 'yes' to 3 of the 4 most salient

questions indicating dry mouth, and one more affirmative answer to another question in the questionnaire, was considered a diagnosis of dry mouth in the study. In order to assess the presence of dry mouth, the amount of unstimulated saliva secretion was also examined. Saliva was collected by patients spitting into a disposable cup within 1 minute. The volume was measured using an automatic pipette fitted with single-use tips. The value of 0.3–0.4 ml/min was taken as the norm for unstimulated saliva secretion [14].

The presence of depressive symptoms was examined using the Geriatric Depression Scale (GDS). The Geriatric Depression Scale is a commonly used screening tool to assess the severity of depressive symptoms in the elderly. The study used an abbreviated version of the questionnaire, consisting of 15 questions. Each question had to be answered 'yes' or 'no'. Possible scores range from 0 to 15 points. The interpretation of the abbreviated version is based on the number of points obtained: 0–5 points mean no risk of depression, 6–10 points mean moderate depression, and 11–15 points mean severe depression [15, 16].

In the statistical analysis, Chi^2 tests with appropriate corrections were used to assess the frequency of occurrence of a given phenomenon for nominal variables. For continuous variables, with a distribution other than normal, the Mann-Whitney U test was used to assess the differences between groups. The median along with the 25% and 75% quartiles were applied to describe continuous variables. The distribution of continuous variables was examined using Shapiro-Wilk's W test. A univariate and multivariate regression model was applied to assess factors that may influence the occurrence of the endpoint. The effect of factors in the model was assessed using the odds ratio (OR) and its 95% confidence interval (95% CI). Statistical significance for the analyses was assumed at $p<0.05$. The STATISTICA version 13.3 software (TIBCO, Poland 2022) was used for the analyses.

Results

As a first step, the prevalence of depression was compared against sociomedical and dental factors. The analysis showed that depression was much

more frequently diagnosed among elderly patients (median age 72 years, p=0.003) who demonstrated the symptoms of nervous system diseases (37.00%, p=0.005). Depressive states were much more frequently discovered among patients using prosthetic restorations diagnosed with prosthetic-related inflammation (56%, p=0.014), dry mouth according to the FOX test (51%, p=0.001), and among patients using removable dentures for more than 10 years (Table 1).

The second stage of the analysis focused on finding factors that may be predictors of depression using univariate and multivariate logistic regression analysis. Univariate logistic regression analysis showed that age (OR=1.16, 95% CI: 1.03-1.29), cardiovascular disease (OR=2.89, 95% CI: 1.07-7.84), nervous system disease (OR=7.22, 95% CI: 1.58–32.99), duration of denture use >10 years (OR=3.38, 95% CI: 1.26–9.07), prosthetic-related inflammation (OR=3.69, 95% CI: 1.38–9.83) and dry mouth according to the FOX test (OR=5.91, 95% CI: 1.86–18.85) statistically significantly increase the chance of developing depression. The inclusion of statistically significant factors in the multivariate model showed that only nervous system diseases (OR=6.89, 95% CI: 1.33–35.75) and the presence of dry mouth as assessed by the FOX test (OR=3.80, 95% CI: 1.05–13.73) significantly increased the chance of developing an endpoint (Table 2).

Discussion

Depression is one of the most important and yet least frequently diagnosed health problems in the elderly. By interfering to a significant extent with daily functioning, it negatively affects health behaviors, including those related to oral hygiene, which means that it can have a detrimental effect on oral health.

Older people are more likely than younger people to suffer from chronic somatic and cognitive disorders leading to disability with consequent development of depression Progressive ageing is one of the risk factors for depression [1, 5]. The results obtained in this study confirm the higher prevalence of depression in elderly patients.

Depression, as a complex syndrome, often accompanies many other conditions. It may also be a significant risk factor for other systemic diseases, and, on the other hand, the occurrence of depression is also conditioned by comorbidities [17].

Our own research shows that nervous system diseases (OR=7.22, p=0.011) and cardiovascular diseases (OR=2.89, p=0.037) in univariate logistic regression significantly increase the odds of developing depressive states, which is confirmed by some studies where more advanced depression has been shown in 20% to 25% of people with cardiovascular diseases [18], and similarly in patients after stroke [19].

Statistical significance for cardiovascular disease was not demonstrated in multivariate logistic regression analysis, which may be related to the unevenness of the study groups and the small study population (depression vs none: 59 (83.00%) vs 17 (63.00%), p=0.062).

Depression, as a mental health disorder, may also be a contributing factor to neglecting preventive behaviors confirmed in many studies, and, on the other hand, poor oral hygiene and poor oral health correlate with depressive-like disorders [9–11, 20].

There is also a proven link between missing teeth and depression and anxiety disorders. With extensive missing teeth, problems in the use of prosthetic restorations can lead to difficulties with eating, speaking, laughing, or even sleeping. Yang et al. estimated that the highest levels of anxiety/depression were found in a group of patients after the loss of 8 to 28 teeth [21].

Our study did not show a significant statistical association between missing teeth and depressive states (depression vs. missing: 54 (76.06%) vs. 18 (66.67%, p=0.494), although many studies confirm that the loss of natural teeth can affect the occurrence of depression [12, 22, 23].

Dental status and, at the same time, the associated prosthetic status are not without influence on the quality of life related to the oral cavity and thus on psychological state. The study confirms that the duration of the use of removable prosthetic devices and the status of the prosthetic base are correlated with the occurrence of depression. Depressive states are significantly more common among patients using prosthetic devices for more than

10 years with a diagnosis of inflammation on the prosthetic base, and statistically significantly increase the chance of developing depression.

In a group of elderly patients using removable dentures, especially complete dentures, the problem of dry mouth arises. Xerostomia can compound the negative impact of poor oral health on older people's quality of life and psychological state.

Chou et al. show a significant association between dryness symptoms and mild and severe depression [24]. Subjective feeling of dry mouth may also lead to the development of depressive states [25]. It is supported by the results of our study, which showed a more frequent high score on the GDS among patients who had dry mouth assessed by the FOX test (p=0.001). Additionally, xerostomia as assessed by the FOX test (OR=3.80, p=0.042), together with the presence of nervous system diseases (OR=6.89, p=0.022), statistically significantly increase the chance of developing depressive states among patients above 65 years of age. These factors may be significant predictors of depression among patients; however, the study should be repeated on a much larger study group.

Conclusions

The results of the study showed that there is a significant association between depression and oral health and oral health-related behaviors. There is a correlation between the occurrence of depression and factors related to general health (association with nervous system diseases), as well as the state of the stomatognathic system (association with mucositis under the used prostheses or xerostomia). The study also found that certain factors related to oral health (duration of denture use of more than 10 years, prosthetic mucositis, or dry mouth according to the FOX test) could be the predictors of depression.

Given the high prevalence of depression, it seems crucial to better understand how depression may affect oral health and, on the other hand, which factors related to oral conditions may be associated with the development of depressive conditions [26].

Future research should take a more comprehensive look at the complex group of factors that may moderate the impact of depression on oral health, and at the same time seek to further understand which factors increase the chance of developing depression.

For dentists, it is crucial to consider the role of depression in dental health and overall oral health, while also becoming aware of the impact of oral health on overall mental health. At the same time, interdisciplinary care in elderly patients at risk of depression should be considered.

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TABLES

Table 1. Distribution of GDS scale scores according to sociodemographic and dental data

Factor		Depression based on GDS scale		p
		Yes (N=71)	No (N=27)	
Age [years]		72.00 (69.00–76.00)	69.00 (66.00–73.00)	0.003*
Gender	Female	40 (56.00%)	17 (63.00%)	0.715
	Male	31 (44.00%)	10 (37.00%)	
Smoking		23 (32.00%)	5 (19.00%)	0.268
Diseases	Cardiovascular	59 (83.00%)	17 (63.00%)	0.062
	Nervous system	26 (37.00%)	2 (7.00%)	0.005*
	Gastrointestinal system	26 (37.00%)	7 (26.00%)	0.446
	Osteoarticular system	16 (23.00%)	10 (37.00%)	0.231
	Thyroid	10 (14.00%)	5 (19.00%)	0.818
	Diabetes	14 (20.00%)	5 (19.00)	0.880
Interest in prosthetic treatment		31 (44.00%)	8 (30.00%)	0.299
Missing teeth	≤10 teeth	17 (23.94%)	9 (33.33%)	0.494
	>10 teeth	54 (76.06%)	18 (66.67%)	
Inflammation on the prosthetic base		40 (56.00%)	7 (26.00%)	0.014*
Service life of dentures	>10 years	59 (83.00%)	16 (59.00%)	0.026*
	≤10 years	12 (17.00%)	11 (41.00%)	
Unstimulated saliva production in 1 minute	Incorrect	28 (39.44%)	6 (22.22%)	0.173
	Correct	43 (60.56%)	21 (77.78%)	
Assessment of dry mouth by the Fox test		36 (51.00%)	4 (15.00%)	0.001*

*p values<0.05

Table 2. Univariate and multivariate logistic regression versus association with depression

Factor		Logistic regression			
		Single-factorial		Multi-factorial	
		OR (95% CI)	p	OR (95% CI)	p
Age [years]		1.16 (1.03–1.29)	0.014*	1.14 (0.99–1.30)	0.063
Gender	Female vs Male	0.76 (0.31–1.89)	0.553	—	—
Smoking	Yes vs No	2.11 (0.71–6.28)	0.180	—	—
Cardiovascular diseases	Yes vs No	2.89 (1.07–7.84)	0.037*	1.73 (0.50–5.96)	0.386
Nervous system diseases	Yes vs No	7.22 (1.58–32.99)	0.011*	6.89 (1.33–35.75)	0.022*
Gastrointestinal diseases	Yes vs No	1.65 (0.62–4.43)	0.319	—	—
Osteoarticular diseases	Yes vs No	0.50 (0.19–1.29)	0.150	—	—
Thyroid diseases	Yes vs No	0.72 (0.22–2.35)	0.587	—	—
Diabetes	Yes vs No	1.08 (0.35–3.36)	0.893	—	—
Service life of dentures	>10 vs ≤10	3.38 (1.26–9.07)	0.016*	2.21 (0.66–7.41)	0.198
Interest in prosthetic treatment	Yes vs No	1.84 (0.71–4.76)	0.208	—	—
Inflammation on the prosthetic base	Yes vs No	3.69 (1.38–9.83)	0.009*	3.08 (0.99–9.60)	0.053
Unstimulated saliva production in 1 minute	Incorrect vs Correct	2.28 (0.82–6.35)	0.115	—	—
Assessment of dry mouth by the Fox test	Dryness vs lack of dryness	5.91 (1.86–18.85)	0.003*	3.80 (1.05–13.73)	0.042*

*p values<0.05