IMPACT OF DENTURES ON ORAL HEALTH-RELATED QUALITY OF LIFE

UTICAJ STOMATOPROTETIČKIH NADOKNADA NA KVALITET DENTALNOG ZDRAVLJA

Sanja GNJATO

Summary

Introduction. Stomatoprosthetic dentures are one of the factors of oral health and life quality of people of all ages. The aim of the paper is to make a connection between the oral health quality and quality of life on one side and the type of denture on the other. Material and Methods. This research study was conducted on the sample of 360 patients singled out in three numerically identical groups as follows: group I – patients treated with fixed dentures, group II - patients treated with mobile dentures, and group III – patients treated with both fixed and mobile dentures. The oral health quality was observed via five parameters: anamnestic data, symptoms of ill-functioning of basic functions in stomatogenic system (chewing and speech), extra oral examination, intraoral examination, and dental abilities. For some oral health quality parameters, the index of quality was determined. Results. Analyses of our three target groups of patients indicated that the patients from group I (treated with fixed dentures) suffered the least negative effects in line with the observed parameters; they are followed by patients from group III (combined dentures) and patients from group II (mobile dentures), respectively. Conclusion. Our research study showed that some oral health parameters have different impacts on health and life quality in patients treated with different stomatoprosthetic dentures. Key words: Oral Health; Dental Care; Quality of Life; Denture, Partial, Fixed; Denture, Partial, Removable; Dental Records; Patient Satisfaction

Sažetak


Introduction

One of the most important goals of dental care and protection is to help patients preserve their oral health and become satisfied with their oral healthcare and quality of life in general [1–7]. Generally, dental health is still not being paid enough attention as it does not directly endanger a patient’s life. There are also researchers who still ignore the effects that the oral cavity and teeth have on general health condition [8]. Still, research studies on dental and oral health and a whole range of factors that affect quality of life (QoL – Quality of Life) have significantly advanced in late 20th and early 21st century [9–14].

Dental status and problems with stomatoprosthetic rehabilitation affect social activities such as work ability, family and parenting actions, emotional life, etc. Stomatognathic issues, also recognized as patients’ satisfaction with their dental status, are evident through esthetics, performance and function [15–19].

Some studies [20–23] suggest that dental diseases and consequences of stomatoprosthetic treatment affect patients’ ability to enjoy life, interact with other people, succeed at work and remain positive. There are different indicators of patients’ dental status satisfaction such as chewing, taste sense, pain, speech ability, esthetic sensation etc. All these affect the Quality of Life (QoL) [24–28].
Speaking of the effect of oral health on the quality of life, many authors infer that patients treated with mobile dentures are more satisfied in comparison with those patients treated with fixed dentures [29, 30]. Some studies showed that oral health largely affected patients’ quality of life so that many patients observed the negative impact of the impaired dental health on their psychological, social and physical aspects of life [31].

According to some studies, the psychological profile, regardless of age and sex, largely affects the subjective idea of quality of life in line with stomatoprosthetic treatment [32]. Some clinical studies [33, 34] particularly [35–38] investigated the quality of oral health of patients who had undergone stomatoprosthetic treatment and the general conclusion was that dental implants resulted in short-term quality improvement when compared to conventional treatments. Furthermore, there are studies which inferred that functional limitations and restricted social functions largely affected the quality of life [39, 40]. Some studies on oral health proved that diet affected the dental caries prevention [41] as well as the knowledge and dental behavior of parents and school children [42]. Other studies on oral status and quality of oral health [43, 44] pointed out the complexity of this issue and proved that there was no universal approach to its solution.

**Material and Methods**

This study included three groups of patients treated with different types of dentures. There were 180 male and 180 females patients. The following three age groups were made: a) up to 60 years of age, b) between the ages of 60 and 70 years and c) over 70 years of age. Each age groups included 120 patients, which made the total sample of 360 patients.

I – The first group of patients were those treated with fixed dentures, i.e. 120 patients. This group consisted of patients treated with fixed dentures covering at least 50% of both maxillary and mandibular teeth;

II – The second group consisted of patients treated with mobile dentures, i.e. 120 patients. Among these patients, 30 were treated with both total dentures, 30 were treated with total maxillary and partial mandibular dentures, 30 patients were treated with partial maxillary and total mandibular dentures, and 30 patients were treated with partial mandibular and maxillary dentures.

III – The third group of patients were those treated with both mobile and fixed dentures, i.e. 120 patients who met the following conditions: a) total maxillary denture and fixed mandibular denture – 30 patients, b) total mandibular denture and fixed maxillary denture – 30 patients, c) combined fixed and mobile maxillary dentures and partial mandibular dentures – 30 patients, d) combined fixed and mobile mandibular dentures and partial maxillary dentures – 30 patients.

A special dental chart was designed for the purpose of our study and data were recorded for each patient individually. The following data based upon 94 features were entered into the chart:

- General information: index (score) of the “general information” category of oral health quality,
- K_A – regression coefficient: hierarchical barycenter coefficient for the “general” category of oral health quality,
- K_A – independent variable: index (score) of the “general” category of oral health quality,
- I_A – independent variable: index (score) of the “general” category of oral health quality,
- K_S – regression coefficient: hierarchical barycenter coefficient for the „symptoms” category of oral health quality,
- I_S – independent variable: index (score) of the „symptoms” category of oral health quality,
- K_DS – regression coefficient: hierarchical barycenter coefficient for the „extraoral” category of oral health quality,
- I_DS – independent variable: index (score) of the „extraoral” category of oral health quality,
I_DS – independent variable: index (score) of the “intraoral dental status” category of oral health quality.

K_DS – regression coefficient: hierarchical barycenter coefficient for the “dental abilities” category of oral health quality.

I_DS – independent variable: index (score) of the “dental abilities” category of oral health quality.

In order to determine the oral health quality index, it was necessary to set the following indicators for each observed category:

- a) relevance ranking,
- b) relevance level – barycenter coefficient: hierarchical, uniformed, etc.,
- c) contribution: positive – the more the better, negative – the less.

In this regard, hierarchical barycenter coefficient for each category was determined and the ranking hierarchy read “the strongest impact, the highest coefficient; the weakest impact, the lowest coefficient”.

- The first impact category (rank one) is the “quality index of intraoral examination”;
- The second impact category (rank two) is the “quality index of extraoral examination”;
- The third category (rank three) is the “quality index of ill-functioning of basic functions (chewing and speech)”;
- The fourth category (rank two) is the “quality index of anamnesis”;
- The fifth category (rank two) is the “quality index of dental abilities”.

A graph of the oral health quality index was provided based on the general regression equation and Table 1:

\[ I_{KDZ} = 2 \times I_A + 3 \times I_S + 4 \times I_{DSE} + 5I_{DSI} + 1 \times I_{DS} \]

The following step in calculating the Oral health quality index was to set an algorithm for specific categories of oral health quality and their components.

The procedure was as follows:

a) Oral health quality category “Anamnesis”.

The equation for calculation of the “Anamnesis” category of oral health quality was:

\[ IA = \frac{1}{13} (4 \times KOM + 3 \times FR + 13 \times OT + 12 \times TMS + 10 \times OKT + 9 \times OKD + 6 \times MZ + 11 \times BDP + 8 \times PAR + 5 \times S + 7 \times AT + 1 \times SP + 2 \times NN) \]

b) “Symptoms” category of oral health quality.

The equation for calculation of the “Symptoms” category of oral health quality was:

\[ IS = \frac{1}{6} (6 \times I_s + 2 \times II_s + 2 \times III_s + 4 \times IV_s + 5 \times V_s + 3 \times VI_s) \]

**Table 1. Values of hierarchical barycentre coefficients of different dimensions of oral health quality**

<table>
<thead>
<tr>
<th>Independent variables of oral health quality</th>
<th>Quality/Kvalitet</th>
</tr>
</thead>
<tbody>
<tr>
<td>Nezavisne varijable kvaliteta dentalnog zdravlja</td>
<td>Relevance ranking</td>
</tr>
<tr>
<td>Quality index of anamnesis</td>
<td>4</td>
</tr>
<tr>
<td>Quality index of symptoms of ill-functioning basic functions (chewing and speech)</td>
<td>3</td>
</tr>
<tr>
<td>Quality index of extraoral examination</td>
<td>2</td>
</tr>
<tr>
<td>Quality index of intra-oral examination</td>
<td>1</td>
</tr>
<tr>
<td>Quality index of dental abilities</td>
<td>5</td>
</tr>
</tbody>
</table>
c) “Extraoral dental status” category of oral health quality.

The equation for calculation of the “Extraoral dental status” category of oral health quality was:

\[ IDSE = \frac{1}{8} (3 \cdot AL + 2 \cdot DZ + 8 \cdot NV + 1) \]

\[ JG + 7 \cdot PZ + 6 \cdot POS + 5 \cdot KZ + 4 \cdot POMM \]

d) “Intraoral dental status” category of oral health quality.

The equation for calculation of the “Intraoral dental status” category of oral health quality was:

\[ IDSI = \frac{1}{11} (4 \cdot VS + 7 \cdot SP + 2 \cdot NH + 9 \cdot PBS + 8 \cdot PPT + 11 \cdot OAG + 10 \cdot PKJ + 6 \cdot J + 3 \cdot VPUD + 5 \cdot VP + 1 \cdot SNN) \]

e) “Dental abilities” category of oral health quality.

The equation for calculation of the “Dental abilities” category of oral health quality was:

\[ ID5 = \frac{1}{5} (-1 \cdot IZ + 5 \cdot BOL + 3 \cdot UD + 2 \cdot IS - 4 \cdot OJ) \]

The obtained values of different categories of oral health quality are relative as they depend on the obtained result, which means that another study might provide different results. It would be more reliable if there were standards for oral health quality with absolute value categories. However, even such a relative assessment of oral health quality is quite valid and meets the needs of initial studies within this field. After multiple studies and polycentric research within the field of oral health quality, we may expect the method of determination of oral health quality to become widely applied.

Graph 2. Distribution of patients per oral health quality in reference to the “pain” category of dental abilities.

Graph 3. Distribution of patients per oral health quality in reference with the “comfort” category of dental abilities.

Testing has shown that there are highly statistically relevant differences between the oral health quality and the “pain” category of dental abilities (p=0.0000).

Testing has shown that there are no statistically relevant differences between the oral health quality and the “comfort” category of dental abilities (p=0.0633).

Results

For the purpose of this paper, only partial results are provided in order to introduce a standardized model for monitoring dental abilities and oral health quality in clinical practice as an interaction between the practitioner and patient. We provided a detailed outline of the following features:

- Demographic characteristics (9 features);
- Anamnestic data (16 features): cause of visit, comorbidity, risk factors, basic symptoms, pain in masticatory system, occlusal trauma, occlusal disharmony, tooth mobility, toothache, parodontopathy, teeth grinding, arthropatic pain, time elapsed between a tooth loss to getting dentures, mobile or fixed denture treatment, the denture stability, denture discomfort;
- Symptoms of ill-functioning stomatogenic system (chewing and speech) (6 features): any chewing discomfort, food-chewing ability, avoiding food, unilateral or bilateral mastication, discomfort during or after chewing, sound produced during the chewing;
- Dental status – Extraoral (8 features): face asymmetry caused by dental status, tooth visibility during speech production, unequal jaws, speech clarity, joint mobility, palpatory sensitivity of joints, joint crepitation, palpatory sensitivity of masticatory muscles;
- Dental status – Intraoral (12 features): tooth status, tooth vitality, parodontium condition, hygiene level, mucous change in the membrane color, pathological changes in all tissues, the shape of alveolar ridge, bone salience in jaws, tongue status and characteristics, height of mouth cavity floor, saliva viscosity, condition of old denture;
In line with dental ability “Satisfaction”, most patients in all three groups made a connection between tooth appearance and their everyday activities and testings proved that there were statistically significant differences among the groups (p=0.0000).

In line with dental ability “Eating limitations”, all three groups of patients felt different intensity. Testings proved that there were statistically significant differences among the groups (p=0.0000). The study showed that total dental abilities in patients from all three groups were mostly unsatisfactory and only few patients were either fully or poorly satisfied. There were statistically highly significant differences among groups in line with total dental abilities (p=0.0000).

Results of analysis of the quality of oral health
While performing a comparative analysis of the sample in reference among dental abilities, we used the total sample. For the purpose of the paper, a brief version is provided. Testing showed that there were highly statistically relevant differences between the oral health quality and the “appearance” category of dental abilities (p=0.0000) (Graph 1). Testing has shown that there were no statistically relevant differences between the oral health quality and the “eating limitation” category of dental abilities (p=0.0000) (Graph 2).

Testing showed that there were no statistically relevant differences between the oral health quality and the “pain” category of dental abilities (p=0.0000) (Graph 3).
and the „commodity” category of dental abilities $(p=0.0633)$ (Graph 3).

Testing showed that there were highly statistically relevant differences between the oral health quality and the „satisfaction” category of dental abilities $(p=0.0000)$ (Graph 4).

Testing showed that there were no statistically relevant differences between the oral health quality and the „eating limitation” category of dental abilities $(p=0.0633)$ (Graph 5).

In addition no statistically relevant differences were found between the oral health quality and total dental ability (dental ability score) $(p=0.0797)$.

Discussion

The research results presented in this study suggest that different levels of oral health and patients’ satisfaction and quality of life depend on a whole range of factors. In this regard, dentures have the greatest impact. Different studies [46], including the one presented hereby [47], have inferred that a patient’s satisfaction with oral health, apart from objective reasons, also depends on subjective reasons, i.e. one’s psychological profile.

In addition, results of some studies confirmed a connection between the oral health and physical, mental, social and general health condition and found a link between the oral health index and index of perception of general health (as well as a connection between the mental health index and two indicators of physical health condition but to a lesser extent).

A special dental chart was designed and individual records were kept for each patient for the purpose of our study. The patients were asked to choose one of the following answers in the questionnaire on dental abilities: positive, neutral, and negative. Based on the “dental chart” data, a model of oral health quality was designed (a linear regression model with a hierarchical barycenter coefficient). Based on the model of quality of oral health, the index of oral health quality was calculated [47].

The study sample was divided into three study groups. The first study group (patients treated with fixed dentures) had no subgroups, but the second and third groups (patients treated with mobile and combined dentures) were further divided into subgroups in order to estimate differences in oral health quality and quality of life. The analyses showed that 27 study features had statistical and high statistical relevance, and 4 features had no statistical relevance.

Furthermore, analyses showed that the patients treated with fixed dentures had the least negative effects of the tested features, followed by the patients treated with mobile and fixed dentures, and finally the patients treated with mobile dentures.

The analyses of the oral health quality indicated that 36 out of 49 analyzed features had significant or highly significant relevance, whereas 7 features had no relevance. In addition, 6 features did not meet all the conditions necessary for the testing of statistical relevance. All the target features with statistically relevant differences in reference to oral health were proved to have a negative affect on dental abilities, and the patients in higher categories of oral health were less influenced by the negative target features.

Hence, the results of comparative analyses of target features and oral health quality for statistically relevant differences have shown that the oral health quality is in accordance with the age and denture type and depends on the following: basic difficulties, IKP contact, tooth mobility, paradontopathy, parafunction activities of OF system (bruxism), arthropathy, time elapsed from tooth edentulation to denture embedding, denture stability, comfort/discomfort in wearing dentures, etc. Oral health quality is highly influenced by mastication followed by sound effects, face asymmetry, tooth length, vertical dimension of occlusion, speech clarity, mobility and palpatory sensitivity of temporomandibular joints, crepitation in temporomandibular joints, palpatory sensitivity of masticatory muscles, condition of paradonts, hygiene level, condition of mouth cavity mucous membrane, pathological changes in mouth cavity tissue, shape of a toothless alveolar ridge, bony pops in the jaw, the tongue shape, size and function, saliva viscosity, condition of old dentures. Taking into account the “appearance” category of dental abilities, a patient’s Oral health quality is affected by looks, colour, and tooth distribution. As for the “pain” category of dental abilities, KDZ is affected by the pain intensity and duration, whereas “satisfaction” is affected by the tooth appearance.

The comparative analyses of the target features and oral health quality in reference to the study groups (in case of statistically relevant differences) showed that oral health quality was highly affected by dental pain (caries, pulpitis, paradontopathy, occlusal trauma), undefined pain, food avoidance, pain due to inadequate denture, vomiting urge, difficulty in swallowing, condition of retention teeth and their supporting tissue, position of the remaining teeth, contact between the neighboring teeth and antagonist, and the extent of absorption of the residual alveolar ridge.

Results of comparative analysis of the target features and oral health quality for statistically insignificant differences showed that OHQ was not affected by sex and age of patients.

Conclusion

This paper estimated a relation among the dental status, quality of oral health and quality of life of patients treated with different stomatoprosthetic dentures (mobile, fixed, combined).

The results of this research study have shown that there are no statistically significant differences in line with gender in comparison with the relevant research parameters; there are statistically significant and highly significant differences between age groups in line with “pain”, “satisfaction” and “eating limitation” dimensions of dental abilities in comparison with “appearance” and “commodity” dimensions.
Analyses of study groups also indicated that the patients from group I (fixed dentures) suffered less negative impact in line with the referential features; the patients from group III came second (combined dentures); the patients from group II were third (mobile dentures).

Appendix I

Elements for calculation of quality of oral health

Equation for calculation of the index of oral health quality

\[ I_{KDZ} = 2 \cdot I_A + 3 \cdot I_S + 4 \cdot I_{DSE} + 5 \cdot I_{DSI} + 1 \cdot I_{DS} \]

KDZ - Oral life quality

I\(_A\) - Index (score) of the “anamnestic” category of oral health quality

I\(_S\) - Index of quality of symptoms of ill-functioning basic functions

I\(_{DSE}\) - index (score) of the “extra-oral dental status” category of oral health quality

I\(_{DSI}\) - index (score) of the “intraoral dental status” category of oral health quality

I\(_{DS}\) - index (score) of the “dental abilities” category of oral health quality.

Equation for calculation of index of “anamnesis” dimension of oral health quality

\[ I_{IA} = \frac{1}{13} \left( 4 \cdot KOM + 3 \cdot FR + 13 \cdot OT + 12 \cdot TMS + 10 \cdot OKT + 9 \cdot OKD + 6 \cdot MZ + 11 \cdot BDP + 8 \cdot PAR + 5 \cdot S + 7 \cdot AT + 1 \cdot SP + 2 \cdot NN \right) \]

KOM - comorbidity; FR - factors of risk; OT - basic problems; TMS - masticatory system problems; OKT - occlusal trauma; OKD - occlusal dis-harmony; MZ - tooth mobility; BDP - dental pain; PAR - Parodontopathy; S - bruxism; AT - Arthritic problems; SP - denture stability; NN - discomfort with wearing dentures.

Equation for calculation of index of “symptom” dimension of oral health quality

\[ I_{IS} = \frac{1}{6} \left( 6 \cdot Is + 1 \cdot II_s + 2 \cdot III_s + 4 \cdot IV_s + 5 \cdot V_s + 3 \cdot VI_s \right) \]

Is – Does the patient have chewing difficulties?

II\(_s\) – Can the patient chew food?

III\(_s\) – Does the patient avoid food?

IV\(_s\) – Does the patient use both or one side of the jaw when chewing food?

V\(_s\) – Does the patient feel discomfort during or after chewing?

VI\(_s\) – Is chewing accompanied with a sound effect?

Equation for calculation of index of “dental status extraoral” dimension of oral health quality

\[ I_{IDSE} = \frac{1}{8} \left( 3 \cdot AL + 2 \cdot DZ + 8 \cdot NV + 1 \cdot JG + 7 \cdot PZ + 6 \cdot POS + 5 \cdot KZ + 4 \cdot POMM \right) \]

AL - face assymetry; DZ - tooth length; NV - jaw disproportion; JG - speech clarity; PZ - joint mobility; POS - Palpatory joint sensitivity; KZ - joint crepitation; POMM - Palpatory sensitivity of masticatory muscles.

Equation for calculation of index of “dental status intraoral” dimension of oral health quality

\[ I_{IDSI} = \frac{1}{11} \left( 4 \cdot VZ + 7 \cdot SP + 2 \cdot NH + 9 \cdot PBS + 8 \cdot PPT + 11 \cdot OAG + 10 \cdot PKI + 6 \cdot J + 3 \cdot VPUD + 5 \cdot VP + 4 \cdot SSN \right) \]

VZ - tooth vitality; SP - paradonthium condition; NH - level of hygene; PBS - mucuos membrane discoloration; PPT - Pathological changes in all tissue; OAG - alveolar ridge shape; PKI - bone salience in lower and upper jaws; J - shape, size and function of the tongue; VPUD - heigth of oral cavity floor; VP - saliva viscosity; SSN - old denture condition.

Equation for calculation of index of “dental abilities” dimension of oral health quality

\[ I_{IDS} = \frac{11}{55} \left( -1 \cdot IZ + 5 \cdot BOL + 3 \cdot UD + 2 \cdot IS - 4 \cdot OJ \right) \]

IZ – Dimension: APPEARANCE

BOL– Dimension: PAIN

UD – Dimension: COMFORT

IS – Dimension: SATISFACTION

OJ – Dimension: EATING LIMITATIONS
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