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Oral health-related quality of life among young adults in Poland

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A – Study Design, B – Data Collection, C – Statistical Analysis, D – Data Interpretation, E – Manuscript Preparation, F – Literature Search, G – Funds Collection

Summary **Background.** Oral health-related quality of life (OHRQoL) is a multidimensional concept that describes quality of life in relation to oral health, with important implications for research, clinical practice and public health interventions.
Objectives. The aim of the study was to assess the level of OHRQoL in young adults and its determinants.
Material and methods. Data was collected in a group of 527 young adults through an online questionnaire. The questionnaire included questions about socio-demographic factors, health status and health behaviours, including oral health, and the Oral Health Impact Profile-14 (OHIP-14). Multiple logistic regression was used to examine the relationship between young adults' characteristics and good OHRQoL.
Results. The global mean value of OHIP-14 was 5.70 (SD = 7.15). 428 respondents (81.2%) showed good OHRQoL. Enablers of good OHRQoL were: place of residence < 20,000 inhabitants (OR = 4.985 [1.033–24.062], p = 0.045), no oral health problem (OR = 2.523 [1.011–6.295], p = 0.047), brushing teeth twice a day or more (OR = 1.823 [1.046–3.178], p = 0.034). Barriers included: own health issues lasting for 6 months or more (OR = 0.515 [0.307–0.863], p = 0.012), pressure to have a 'perfect smile' (OR = 0.322 [0.191–0.543], p < 0.001), never flossing (OR = 0.470 [0.276–0.801], p = 0.005), missing teeth (OR = 0.284 [0.129–0.627], p = 0.002), coexistence of oral health problems (OR = 0.288 [0.164–0.506], p < 0.001), dental check-ups less than once a year (OR = 0.534 [0.315–0.906], p = 0.020).
Conclusions. Development and implementation of activities aimed at the improvement of oral health and reducing health inequities among young adults require proper identification of enablers and barriers to good OHRQoL with regard to socio-demographic status, health status, including oral health and oral health behaviours.
Key words: oral health, behavior, quality of life, young adult.

Background

According to the Dental World Federation (FDI), "oral health is multifaceted and involves the ability to smell, touch, taste, chew, swallow, smile, speak and conveys a variety of emotions through facial expressions with confidence and without discomfort, pain or disease in the craniofacial region" [1]. Oral health is an extremely important part of general health, since the oral cavity is not only an integral part of the body, but it is also responsible for supporting and enabling essential human functions. Oral health includes physical, psychological, emotional and social domains essential for overall health and well-being [2].

The concept of the quality of life (QoL) was first applied in medicine in the 1970s and was borrowed from social sciences. Studies on the quality of life conducted in various fields of science have shown that people understand quality of life as wellbeing, satisfaction and a sense of happiness. The term health-related quality of life (HRQoL) was then coined [3, 4]. In 1994, Locker and Miller introduced the term Oral Health-Related Quality of Life (OHRQoL) in the field of dentistry [5, 6]. The first study on the quality of life of a dental patient was made by G.D. Slade and A.J. Spencer in Australia in 1994. Their Oral Health Impact Profile (OHIP-49 or its shorted version OHIP-14) is widely used in clinical practice and research for the assessment of OHRQoL in different target populations [7, 8].

The relationship between oral health and quality of life is determined by the degree of ability to chew, bite, swallow, speak, be in good mental condition (be satisfied with the appearance of teeth, have high self-esteem), be in good physical condition (feel comfortable while eating, feel no discomfort or pain) and feel good in social situations (feel comfortable while having a conversation) [9].

Assessment of dental care only by analysing epidemiological indicators of oral health and the prevalence of risk factors for oral diseases does not seem to be the best method. Patient care should not be limited to the biological dimension of health. It is also highly important to analyse whether the applied treatment and activities in the area of oral health prevention and promotion will improve everyday functioning of the patient, reduce their physical and mental suffering and allow for full activity in family and social life [5, 9, 10].

The term oral health-related quality of life (OHRQoL) refers to the extent to which oral diseases affect the normal functioning of an individual and is considered an integral part of overall health and well-being. This concept has been widely used in medical activities and in studies on the results of preventive and therapeutic programmes in the field of oral health [11–13]. OHRQoL is considered to be an important health indicator with significant implications for clinical practice, scientific research and development and implementation of public health interventions for oral health. Research in this area is used to provide information on the negative impact of oral diseases on health and quality of life, as well as the effectiveness of health services that are aimed at reducing this negative impact [14].

Studies on oral health-related quality of life (OHRQoL) have been conducted among young adults in many countries worldwide [15–18]. In the group of young adults, a dynamic transition between adolescence and adulthood can be observed, which is accompanied by challenges such as taking responsibility for one's health, e.g. due to the need to continue education or take up a job outside the place of residence. These challenges can lead to changes in lifestyle and behaviours and affect health. Young adults are an important group of the beneficiaries of a healthcare system, including the dental care system. Furthermore, if the resources in one area of a healthcare system turn out to be scarce, research findings in this area can help ensure that appropriate public health interventions are targeted at factors that may negatively impact OHRQoL [19]. Self-assessment of oral health-related quality of life largely depends on available resources, which include age, level of education, socio-economic status, level of medical knowledge and health status. Risk factors include pro-health and anti-health behaviours (e.g. eating habits, physical activity, smoking, drinking alcohol), stressful life events and strategies for coping with stress [15, 20–22].

Objectives

The aim of the study was to assess the oral health-related quality of life in young adults and to analyse its predictors. The study was guided by the following research questions:
- What is the level of oral health-related quality of life and its seven conceptual domains among young adults?
- How do individual variables related to the socio-demographic status, general health status and oral health status affect OHRQoL?

Material and methods

Conceptual framework

The conceptual framework of the study consisted of 5 constructs (A-E) related to oral health-related quality of life (OHRQoL) (Figure 1). Based on previous study reports [6, 11, 15–22], it was assumed that factors related to socio-demographic status, general health status and oral health status may play an important role in shaping the level of quality of life. Construct A concerns socio-demographic variables, constructs B and C are related to health status and health behaviours, and constructs D and E concern oral health status and oral health behaviours.

Study population

The sample in this cross-sectional study was comprised of young adults recruited via convenience sampling. The main in-clusion criterion was being between 18–35 years of age. The study was conducted in the period 13.07.2022–5.11.2022. Participation in the study was anonymous and voluntary.

Data acquisition

Data was collected through an online questionnaire that included the Oral Health Impact Profile (OHIP-14) which was used to assess oral health-related quality of life [23, 24].

The questionnaire focused on the influence of oral health limitations on the quality of life of the respondents [7].

OHIP-14 consists of 14 questions related to any problems with teeth, the oral cavity or dentures which the respondent encountered in the last month prior to the study. The questions were grouped into 7 domains and concern the following health problems:

- I.   Functional limitations: (1) Trouble pronouncing any words, (2) Worsened taste.
- II. Physical pain: (3) Aching in mouth, (4) Discomfort while eating food.
- III. Psychological discomfort: (5) Feeling self-conscious, (6) Feeling tense.
- IV. Physical discomfort: (7) Poor diet, (8) Interrupted meals.
- V.   Physical disability: (9) Difficulty relaxing, (10) Embarrassment.
- VI. Social disability: (11) Irritability with other people, (12) Difficulties doing usual jobs.
- VII. Handicap: (13) Less satisfying life, (14) Inability to function.

The respondent's task was to estimate the frequency of a given problem on a 5-point Likert scale (0 = never, 1 = hardly ever, 2 = occasionally, 3 = fairly often, 4 = very often). The negative impact of oral health on human life was illustrated by answers of 3 and 4, whereas the positive impact of oral health was reflected by answers of 2, 1, 0. The OHIP-14 score was the sum of answers to all questions and ranged from 0 to 56, whereby a higher score indicated a more negative impact and a lower OHRQoL.

In the conducted analyses, it was assumed that the respondents who provided the answer 'never' or 'hardly ever' or 'occasionally' to each of the 14 questions were representatives of good OHRQoL.

An original questionnaire was used to measure the socio-demographic variables of young adults, their health status and health behaviours, including those related to oral health. The scope of data collected in the survey is presented in Table 1.

Statistical analysis

The results obtained in the questionnaires were subject to statistical analysis. No data was missing. Data analyses included both descriptive statistics and multiple logistic regres-
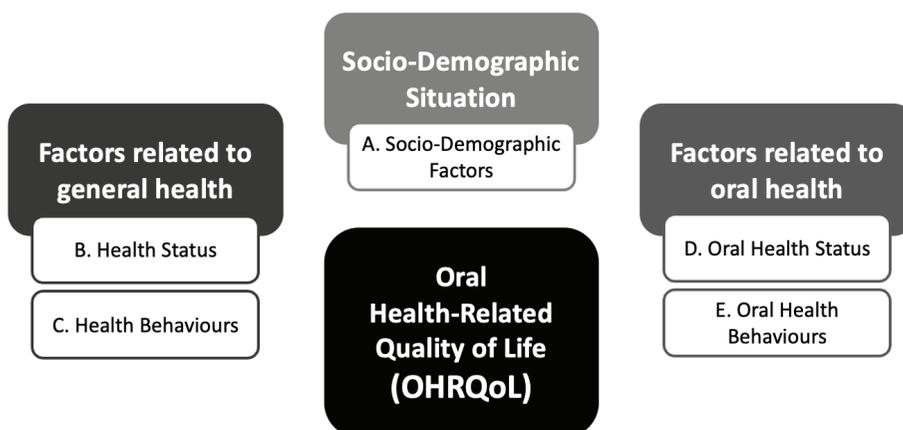

Figure 1. Conceptual framework of the study

Table 1. Frequency of occurrence for respondents' selected characteristics			
Characteristics		*n*	**% of total**
Socio-demographic factors			
Gender	male	136	25.8
	female	391	74.2
Level of education	lower vocational and below	10	1.9
	secondary	327	62.0
	university degree	190	36.1
Place of residence	rural area	120	22.8
	town up to 20,000 inhabitants	41	7.8
	town 20,000–100,000 inhabitants	98	18.6
	city > 100,000 inhabitants	268	50.9
Self-evaluated financial situation	positive	340	64.5
	average	177	33.6
	negative	10	1.9
Educational status	pupil, student	383	72.7
	not in full-time education	144	27.3
Health status			
Health self-assessment	positive (very good + good)	399	75.7
	fair	108	20.5
	negative (bad + very bad)	20	3.8
Health issues lasting for 6 months and longer	yes	176	33.4
	I don't know/hard to say	38	7.2
	no	313	59.4
Body Mass Index (kg/m^2)	underweight (BMI < 18.5)	76	14.4
	normal-weight (BMI 18.5–25)	356	67.6
	overweight and obesity (BMI > 25)	95	18.0
Level of perceived stress	low stress	40	7.6
	moderate stress	221	41.9
	high perceived stress	266	50.5
Health behaviours*			
Smoking	never	307	58.3
	current	167	31.7
	past	53	10.1
Alcohol use	having alcoholic drinks more than twice a week	73	13.9
	drinking alcohol once or twice a month	384	72.9
	not drinking at all	70	13.3
At least 150 minutes per week of moderate to vigorous physical activity	yes	179	66.0
	no	348	34.0
Exercise (physical activity) frequency	twice or more a week	315	59.8
	1–4 times a month	145	27.5
	never – several times a year	67	12.7
Eating behaviours self-assessment	healthy eating behaviours	327	62.0
	I don't know/hard to say	56	10.6
	unhealthy eating behaviours	144	27.3
Dietary habits	having breakfast every day	359	68.1
	3 or more meals every day	375	71.2
	fresh fruits every day	147	27.9
	fresh vegetables every day	228	43.3
	snacks/sweets every day	106	20.1
	sugar-sweetened beverages every day	33	6.3
	having fast food more than once a week	54	10.2
Being on a diet during last 12 months	yes	131	24.9
	no	396	75.1
Oral health status			
Self-reported oral health problems	malocclusion	147	27.9
	dental caries	148	28.1
	dentin hypersensitivity	161	30.6
	missing teeth	35	6.6
	bruxism	59	11.2
	periodontal problems	76	14.4
	no oral health problem	137	26.0
Number of self-reported oral health problems	0	137	26.0
	1	192	36.4
	2	142	26.9
	3 or more	56	10.6

Table 1. Frequency of occurrence for respondents' selected characteristics

Characteristics		n	% of total
Pressured to have a 'perfect' smile	yes	171	32.4
	I don't know/hard to say	98	18.6
	no	258	49.0
Oral health behaviours*			
Toothbrushing frequency	twice or more a day	378	71.7
	once a day	117	22.2
	less than once a day	32	6.1
Flossing frequency	once a day or more	59	11.2
	less than once a day	249	47.2
	never	219	41.6
Mouth rinse frequency	once a day or more	96	18.2
	less than once a day	225	42.7
	never	206	39.1
Fluoride toothpaste use	yes	312	59.2
	no	215	40.8
Whitening toothpaste use	yes	280	53.1
	no	247	46.9
Frequency of dental visit	only in urgent situations or never	85	16.1
	at least once a year	356	67.6
	less than once a year	86	16.3
Last oral health appointment	during the last 12 months	404	76.7
	I don't remember/hard to say	30	5.7
	one year ago or earlier	93	17.6

* The cut-off points for health behaviours were determined by national and/or international recommendations [25–28].

sion. Statistical analyses related to the search for good OHRQoL determinants were conducted in two steps. In the first step, the strength of the relationship between good OHRQoL and socio-demographic factors, health status and health behaviours, including oral health characteristics, was expressed using the odds ratio (with the limits of 95% confidence intervals; 95% CI). In this way, factors that were significantly related to good OHRQoL were identified. These were used as explanatory variables in the second step of statistical analysis performed using the multivariate logistic regression method. This approach made it possible to eliminate interdependencies between explanatory variables and to assess the strength of the relationship between the characteristics of young adults participating in the study and good OHRQoL (outcome variable). The internal consistency of OHIP-14 was verified with Cronbach's alpha coefficients. All statistical analyses were carried out using IBM SPSS Statistics for Windows, version 27.0 (IBM Corp., Armonk, NY, USA). In the calculations, a significance level of $p = 0.05$ was assumed as statistically significant.

Results

Selected characteristics of the study group

There were 527 participants to the study between 18–35 years of age. Female patients constituted 74.2% of the total number of respondents. The sample was heterogeneous in terms of socio-demographic factors, health status and health behaviours, including oral health. Selected characteristics of the respondents are presented in Table 1.

Oral Health Impact Profile (OHIP-14 scores)

The first stage of analysis was evaluation of the general quality of life dependent on oral health. The mean value of the OHIP-14 parameters was calculated as the sum of answers to all questions and amounted to 5.70 ± 7.15 (range: 0 to 56; median: 3). It is worth noting that lower scores indicate better oral health-related quality of life, and higher OHIP-14 scores indicate worse OHRQoL. In the present study, Cronbach's alpha coefficient value of 0.897 was revealed for OHIP-14, indicating good reliability of the scale. The 14 items included in the summary OHIP-14 scale explained 45.8% of the variance of the results. Table 2 shows the mean score of OHIP-14, as well as the number and percentage of respondents who provided the answers to the questions about each OHIP-14 item of *very often*, *fairly often*, *occasionally*, *hardly ever* or *never*.

OHRQoL in the population of young adults is expressed as the number of respondents with a score of 0 in a particular instance. A score of 0 for the OHIP-14 was found in 17.3% of the respondents (91 persons).

With regard to the domains, it was found that the respondents most often complained about physical pain, psychological discomfort and psychological disability. The best evaluated domains were: functional limitation, physical disability and handicap (Table 2, Figure 2).

Table 2. Mean values of the OHIP-14 scores, the number and percentage of respondents who provided the answers to the questions about each OHIP-14 item of *very often*, *fairly often*, *occasionally*, *hardly ever* or *never*

Domains	Mean (SD)	0	1	2	3	4
		Never n (%)	*Hardly ever n (%)*	*Occasionally n (%)*	*Fairy often n (%)*	*Very often n (%)*
I. Functional limitation						
Trouble pronouncing any words	0.26 (0.663)	438 (83.1%)	55 (10.4%)	23 (4.4%)	8 (1.5%)	3 (0.6%)
Sense of taste has worsened	0.08 (0.405)	497 (94.3%)	22 (4.2%)	5 (0.9%)	0 (0.0%)	3 (0.6%)

Table 2. Mean values of the OHIP-14 scores, the number and percentage of respondents who provided the answers to the questions about each OHIP-14 item of *very often*, *fairly often*, *occasionally*, *hardly ever* or *never*

Domains	Mean (SD)	0	1	2	3	4
		Never n (%)	*Hardly ever* n (%)	*Occasionally* n (%)	*Fairy often* n (%)	*Very often* n (%)
II. Physical pain						
Painful aching in mouth	0.82 (0.876)	229 (43.5%)	186 (35.3%)	94 (17.8%)	13 (2.5%)	5 (0.9%)
Uncomfortable to eat any foods	0.80 (0.931)	250 (47.4%)	164 (31.1%)	87 (16.5%)	19 (3.6%)	7 (1.3%)
III. Psychological discomfort						
Felt self-conscious	0.83 (1.090)	283 (53.7%)	118 (22.4%)	77 (14.6%)	32 (6.1%)	17 (3.2%)
Felt tense	0.70 (1.037)	315 (59.8%)	114 (21.6%)	56 (10.6%)	27 (5.1%)	15 (2.8%)
IV. Physical disability						
Unsatisfactory diet	0.25 (0.647)	440 (83.5%)	58 (11.0%)	19 (3.6%)	6 (1.1%)	4 (0.8%)
Had to interrupt meals	0.17 (0.535)	463 (87.9%)	48 (9.1%)	8 (1.5%)	6 (1.1%)	2 (0.4%)
V. Psychological disability						
Difficult to relax	0.33 (0.772)	422 (80.1%)	64 (12.1%)	21 (4.0%)	14 (2.7%)	6 (1.1%)
Been a bit embarrassed	0.44 (0.902)	283 (53.7%)	118 (22.4%)	77 (14.6%)	32 (6.1%)	17 (3.2%)
VI. Social disability						
Been a bit irritable with other people	0.41 (0.869)	406 (77.0%)	58 (11.0%)	36 (6.8%)	21 (4.0%)	6 (1.1%)
Difficulty doing usual jobs	0.12 (0.487)	489 (92.8%)	23 (4.4%)	8 (1.5%)	(0.9%)	2 (0.4%)
VII. Handicap						
Life in general was less satisfying	0.42 (0.863)	397 (75.3%)	75 (14.2%)	30 (5.7%)	16 (3.0%)	9 (1.7%)
Totally unable to function	0.08 (0.410)	499 (94.7%)	19 (3.6%)	3 (0.6%)	5 (0.9%)	1 (0.2%)
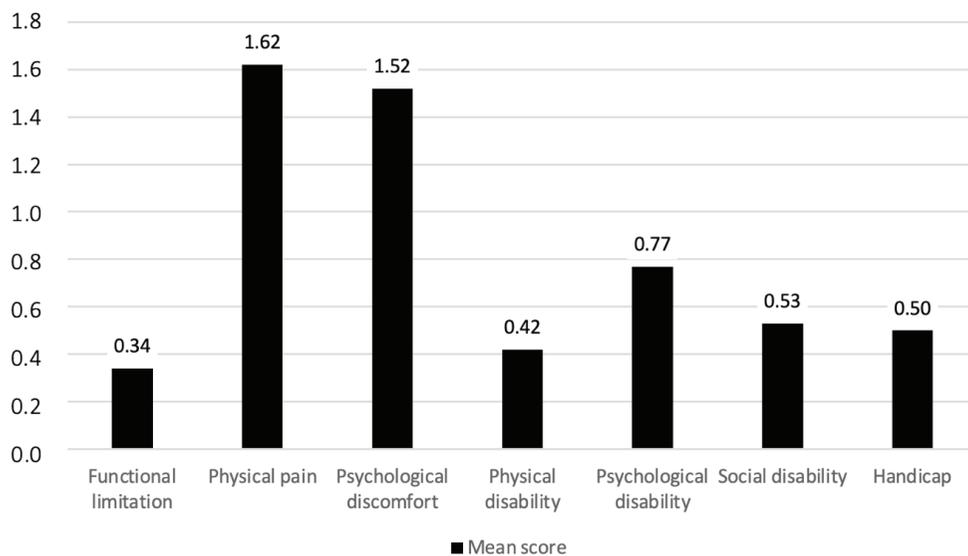
Figure 2. Mean score distribution in different OHIP-14 domains

Based on the OHIP-14 scores, the respondents were divided into two groups: those who were characterised by good OHRQoL (answers: *never* or *hardly ever* or *occasionally* to each of the 14 questions) and those whose oral health negatively impacted OHRQoL (answers: *fairly often* or *very often*). The groups consisted of 428 and 99 persons, respectively. Detailed results in individual groups, depending on the characteristics of the respondents, together with the mean OHIP-14 score, are presented in Table 3.

As a result of the analysis of the data obtained in the survey, factors determining good OHRQoL were selected. The odds ratio is presented in Table 4.

Table 3. OHIP-14 mean score and good OHRQoL based on socio-demographic factors, health status and health behaviours, including factors related to oral health

Characteristics		OHIP-14 Mean (SD)	Good OHRQoL		Total
			Yes n (%)	No n (%)	n (%)
A. Socio-demographic factors					
Gender	male	5.88 (7.54)	116 (85.3%)	20 (14.7%)	136 (100.0%)
	female	5.21 (5.88)	312 (79.8%)	79 (20.2%)	391 (100.0%)
Level of education	lower vocational and below	4.40 (3.34)	9 (90.0%)	1 (10.0%)	10 (100.0%)
	secondary	6.04 (6.99)	255 (78.0%)	72 (22.0%)	327 (100.0%)
	university degree	5.19 (7.54)	164 (86.3%)	26 (13.7%)	190 (100.0%)

Table 3. OHIP-14 mean score and good OHRQoL based on socio-demographic factors, health status and health behaviours, including factors related to oral health

Characteristics		OHIP-14 Mean (SD)	Good OHRQoL		Total
			Yes *n* (%)	No *n* (%)	*n* (%)
Place of residence	rural area	6.57 (8.53)	91 (75.8%)	29 (24.2%)	120 (100.0%)
	town up to 20,000 inhabitants	4.51 (6.00)	39 (95.1%)	2 (4.9%)	41 (100.0%)
	town 20,000-100,000 inhabitants	5.89 (7.55)	82 (83.7%)	16 (16.3%)	98 (100.0%)
	city > 100,000 inhabitants	5.43 (6.44)	216 (80.6%)	52 (19.4%)	268 (100.0%)
Self-evaluated financial situation	positive	5.26 (6.70)	279 (82.1%)	61 (17.9%)	340 (100.0%)
	average	6.08 (6.66)	142 (80.2%)	35 (19.8%)	177 (100.0%)
	negative	14.30 (18.28)	7 (70.0%)	3 (30.0%)	10 (100.0%)
Educational status	pupil, student	5.45 (6.93)	314 (82.0%)	69 (18.0%)	383 (100.0%)
	not in full-time education	6.39 (7.69)	114 (79.2%)	30 (20.8%)	144 (100.0%)
B. Health status					
Health self-assessment	positive (very good + good)	4.62 (5.61)	341 (85.5%)	58 (14.5%)	399 (100.0%)
	fair	8.49 (9.08)	78 (72.2%)	30 (27.8%)	108 (100.0%)
	negative (bad + very bad)	12.35 (13.23)	9 (45.0%)	11 (55.0%)	20 (100.0%)
Health issues lasting for 6 months and longer	yes	6.84 (9.80)	132 (75.0%)	44 (25.0%)	176 (100.0%)
	I don't know/hard to say	7.60 (6.13)	29 (76.3%)	9 (23.7%)	38 (100.0%)
	no	4.84 (6.03)	267 (85.3%)	46 (14.7%)	313 (100.0%)
Body Mass Index (kg/m^2)	underweight (BMI < 18.5)	6.67 (8.93)	56 (73.7%)	20 (26.3%)	76 (100.0%)
	normal-weight (BMI 18.5–25)	5.38 (6.12)	297 (83.4%)	59 (16.6%)	356 (100.0%)
	overweight and obesity (BMI > 25)	6.15 (8.90)	75 (79.0%)	20 (21.0%)	95 (100.0%)
Level of perceived stress	low stress	3.60 (4.88)	37 (92.5%)	3 (7.5%)	40 (100.0%)
	moderate stress	4.62 (5.18)	183 (82.8%)	38 (17.2%)	221 (100.0%)
	high perceived stress	6.92 (8.51)	208 (78.2%)	58 (21.8%)	266 (100.0%)
C. Health behaviours					
Smoking	never	5.19 (6.17)	258 (84.0%)	49 (16.0%)	307 (100.0%)
	current	6.02 (7.64)	130 (77.8%)	37 (22.2%)	167 (100.0%)
	past	7.68 (10.04)	40 (75.5%)	13 (24.5%)	53 (100.0%)
Alcohol use	having alcoholic drinks more than twice a week	7.10 (9.18)	58 (79.6%)	15 (20.4%)	73 (100.0%)
	drinking alcohol once or twice a month	5.35 (6.52)	315 (82.0%)	69 (18.0%)	384 (100.0%)
	not drinking at all	6.19 (7.91)	55 (78.6%)	15 (21.4%)	70 (100.0%)
At least 150 minutes per week of moderate to vigorous physical activity	yes	5.16 (6.58)	145 (81.0%)	34 (19.0%)	179 (100.0%)
	no	5.98 (7.41)	283 (81.3%)	65 (18.7%)	348 (100.0%)
Exercise (physical activity) frequency	twice or more a week	5.23 (6.43)	258 (81.9%)	57 (18.1%)	315 (100.0%)
	1–4 times a month	5.95 (6.85)	115 (79.3%)	30 (20.7%)	145 (100.0%)
	never – several times a year	7.39 (10.21)	55 (82.1%)	12 (17.9%)	67 (100.0%)
Eating behaviours self-assessment	healthy eating behaviours	4.77 (5.89)	273 (83.5%)	54 (16.5%)	327 (100.0%)
	I don't know/hard to say	6.55 (9.21)	48 (85.7%)	8 (14.3%)	56 (100.0%)
	unhealthy eating behaviours	7.50 (8.40)	107 (74.3%)	37 (25.7%)	144 (100.0%)
Dietary habits	having breakfast every day	5.25 (6.21)	300 (83.6%)	59 (16.4%)	359 (100.0%)
	3 or more meals every day	5.18 (6.04)	313 (83.5%)	62 (16.5%)	375 (100.0%)
	fresh fruits every day	4.50 (5.73)	123 (83.7%)	24 (16.3%)	147 (100.0%)
	fresh vegetables every day	4.81 (5.99)	192 (84.2%)	36 (15.8%)	228 (100.0%)
	snacks/sweets every day	6.36 (8.50)	84 (79.2%)	22 (20.8%)	106 (100.0%)
	sugar-sweetened beverages every day	7.03 (10.55)	25 (75.8%)	8 (24.2%)	33 (100.0%)
	having fast food more than once a week	7.70 (9.68)	37 (68.5%)	17 (31.5%)	54 (100.0%)
Being on a diet during last 12 months	yes	6.04 (7.52)	103 (78.6%)	28 (21.4%)	131 (100.0%)
	no	5.59 (7.03)	325 (82.1%)	71 (17.9%)	396 (100.0%)
D. Oral health status					
Self-reported oral health problems	malocclusion	8.50 (8.66)	102 (69.4%)	45 (30.6%)	147 (100.0%)
	dental caries	8.02 (8.52)	109 (73.6%)	39 (26.4%)	148 (100.0%)
	dentin hypersensitivity	8.03 (7.80)	117 (72.7%)	44 (27.3%)	161 (100.0%)
	missing teeth	13.54 (11.17)	16 (45.7%)	19 (54.3%)	35 (100.0%)
	bruxism	8.075 (9.07)	37 (62.7%)	22 (37.3%)	59 (100.0%)
	periodontal problems	9.34 (8.61)	54 (71.1%)	22 (28.9%)	76 (100.0%)
	no oral health problem	1.73 (3.30)	130 (94.9%)	7 (5.1%)	137 (100.0%)
Number of self-reported oral health problems	0	1.73 (3.30)	130 (94.9%)	7 (5.1%)	137 (100.0%)
	1	4.87 (6.18)	166 (86.5%)	26 (13.5%)	192 (100.0%)
	2	7.44 (6.02)	105 (73.9%)	37 (26.1%)	142 (100.0%)
	3 or more	13.88 (10.88)	27 (48.2%)	29 (51.8%)	56 (100.0%)

Table 3. OHIP-14 mean score and good OHRQoL based on socio-demographic factors, health status and health behaviours, including factors related to oral health

Characteristics		OHIP-14 Mean (SD)	Good OHRQoL		Total
			Yes *n* (%)	No *n* (%)	*n* (%)
Pressured to have a 'perfect' smile	yes I don't know/hard to say no	8.26 (9.20) 4.71 (4.06) 4.39 (5.99)	121 (70.8%) 83 (84.7%) 224 (86.8%)	50 (29.2%) 15 (15.3%) 34 (13.2%)	171 (100.0%) 98 (100.0%) 258 (100.0%)
E. Oral health behaviours					
Toothbrushing frequency	twice or more a day once a day less than once a day	5.10 (6.44) 5.93 (6.59) 12.00 (12.41)	319 (84.4%) 91 (77.8%) 18 (56.2%)	59 (15.6%) 26 (22.2%) 14 (43.8%)	378 (100.0%) 117 (100.0%) 32 (100.0%)
Flossing frequency	once a day or more less than once a day never	4.92 (6.84) 5.50 (5.79) 6.37 (8.27)	50 (84.8%) 211 (84.7%) 167 (76.3%)	9 (15.2%) 38 (15.3%) 52 (23.7%)	59 (100.0%) 249 (100.0%) 219 (100.0%)
Mouth rinse frequency	once a day or more less than once a day never	5.70 (7.10) 5.73 (6.92) 5.68 (7.45)	74 (77.1%) 185 (82.2%) 169 (82.0%)	22 (22.9%) 40 (17.8%) 37 (18.0%)	96 (100.0%) 225 (100.0%) 206 (100.0%)
Fluoride toothpaste use	yes no	5.80 (7.49) 5.56 (6.28)	256 (82.1%) 172 (80.0%)	56 (17.9%) 43 (20.0%)	312 (100.0%) 215 (100.0%)
Whitening toothpaste use	yes no	5.27 (6.65) 6.20 (7.65)	233 (83.2%) 195 (78.9%)	47 (16.8%) 52 (21.1%)	280 (100.0%) 247 (100.0%)
Frequency of dental visit	only in urgent situations or never at least once a year less than once a year	7.89 (9.66) 5.12 (6.46) 6.91 (8.29)	61 (71.8%) 300 (84.3%) 128 (74.9%)	24 (28.2%) 56 (15.7%) 43 (25.1%)	85 (100.0%) 356 (100.0%) 171 (100.0%)
Last oral health appointment	during the last 12 months I don't remember / hard to say one year ago or earlier	5.46 (6.70) 8.57 (11.58) 5.85 (7.09)	331 (81.9%) 23 (76.7%) 74 (79.6%)	73 (18.1%) 7 (23.3%) 19 (20.4%)	404 (100.0%) 30 (100.0%) 93 (100.0%)
Total OHIP-14		**5.70 (7.15)**	**428 (81.2%)**	**99 (18.8%)**	**527 (100.0%)**

Table 4. Relationship of the OHRQoL category with socio-demographic characteristics, health status and health behaviours, including factors related to oral health

Characteristics	Odds Ratio for good OHRQoL (OR)	95% Confidence interval limits for OR	*p*
A. Socio-demographic factors			
Female	0.681	0.399–1.163	NS
Secondary education	0.553	0.341–0.896	0.016
University degree	1.744	1.070–2.842	0.026
Place of residence: rural area	0.652	0.399–1.065	NS
Place of residence: town < 20,000 inhabitants	4.862	1.154–20.488	0.031
Place of residence: city > 100,000 inhabitants	0.921	0.595–1.426	NS
Positive self-evaluated financial situation	1.166	0.743–1.832	NS
Pupil's, student's educational status	1.198	0.742–1.934	NS
B. Health status			
Positive self-assessment of health	2.771	1.742–4.407	< 0.001
Own health issues lasting for 6 months and longer	0.557	0.357–0.871	< 0.010
Normal weight (BMI 18.5–25)	1.537	0.979–2.413	NS
Overweight and obesity (BMI > 25)	0.839	0.484–1.455	NS
High perceived stress	0.701	0.452–1.088	NS
C. Health behaviours			
Never smoking	1.549	0.988–2.402	NS
Current smoker	0.731	0.463–1.154	NS
Having alcoholic drinks more than twice a week	0.856	0.525–1.395	NS
Not drinking alcohol at all	0.826	0.445–1.352	NS
At least 150 minutes per week of moderate to vigorous physical activity	0.980	0.618–1.553	NS
Exercise twice or more a week	0.998	0.645–1.546	NS
Exercise never – several times a year	1.069	0.549–2.082	NS
Healthy eating behaviours	1.468	0.943–2.284	NS
Unhealthy eating behaviours	0.559	0.352–0.887	0.014
Having breakfast every day	1.589	1.012–2.496	0.044

Table 4. Relationship of the OHRQoL category with socio-demographic characteristics, health status and health behaviours, including factors related to oral health

Characteristics	Odds Ratio for good OHRQoL (OR)	95% Confidence interval limits for OR	p
Having 3 or more meals every day	1.624	1.026–2.573	0.039
Eating fresh fruits every day	1.260	0.761–2.088	NS
Eating fresh vegetables every day	1.424	0.906–2.236	NS
Eating snacks/sweets every day	0.855	0.503–1.453	NS
Drinking sugar-sweetened beverages every day	0.706	0.308–1.615	NS
Having fast food more than once a week	0.456	0.245–0.850	0.013
Being on a diet during last 12 months	0.804	0.492–1.312	NS
D. Oral health status			
No oral health problem	5.733	2.588–12.704	< 0.001
2 or more oral health problems (coexistence of oral health problems)	0.223	0.140–0.355	< 0.001
Self-reported oral health problem: malocclusion	0.375	0.238–0.591	< 0.001
Self-reported oral health problem: dental caries	0.526	0.333–0.831	0.006
Self-reported oral health problem: dentin hypersensitivity	0.470	0.300–0.737	0.001
Self-reported oral health problem: missing teeth	0.164	0.081–0.332	< 0.001
Self-reported oral health problem: bruxism	0.331	0.185–0.592	< 0.001
Self-reported oral health problem: periodontal problems	0.505	0.291–0.879	0.016
Pressured to have a 'perfect' smile	0.386	0.247–0.604	< 0.001
E. Oral health behaviours			
Brushing teeth twice a day or more	1.984	1.257–3.132	0.003
Brushing teeth less than once a day	0.267	0.128–0.557	< 0.001
Flossing once a day or more	1.323	0.627–2.789	NS
Never flossing	0.578	0.373–0.898	0.015
Mouth rinse once a day or more	0.732	0.428–1.250	NS
Never use mouthwash	1.093	0.697–1.716	NS
Fluoride toothpaste use	1.143	0.735–1.778	NS
Whitening toothpaste use	1.322	0.853–2.048	NS
Visit dentist only in urgent situations or never	0.519	0.305–0.886	0.016
Visit dentist less than once a year	0.556	0.355–0.870	0.010
Last visit to a dentist during the last 12 months	1.215	0.736–2.007	NS
Last visit to a dentist one year ago or earlier	0.880	0.503–1.540	NS

All groups of factors (A–E) presented in Figure 1 which describe the socio-demographic situation of young adults participating in the study, as well as their general health and oral health-related variables, turned out to be statistically significant for good OHRQoL (Table 4).

There is a statistically significant relationship between good OHRQoL and the following factors:

- group A variables (socio-demographic characteristics): university degree (OR = 1.744 [1.070–2.842], $p = 0.026$), secondary education (OR = 0.553 [0.341–0.896], $p = 0.016$), place of residence: town < 20,000 inhabitants (OR = 4.862 [1.154–20.488, $p = 0.031$);
- group B variables (health status): positive self-assessment of health (OR = 2.771 [1.742–4.407], $p < 0.001$), own health issues lasting for 6 months and longer (OR = 0.557 [0.357–0.871], $p < 0.010$);
- group C variables (health behaviours) related only to eating habits: unhealthy eating behaviours (OR = 0.559 [0.352–0.887], $p = 0.014$), having breakfast every day (OR = 1.589 [1.012–2.496], $p = 0.044$), having 3 or more meals every day (OR = 1.624 [1.026–2.573], $p = 0.039$), having fast food more than once a week (OR = 0.456 [0.245–0.850], $p = 0.013$);
- all group D variables (oral health status): no oral health problem (OR = 5.733 [2.588–12.704], $p < 0.001$), coexistence of oral health problems, i.e. 2 or more oral health problems (OR = 0.223 [0.140–0.355], $p < 0.001$), self-reported oral health problem: malocclusion (OR = 0.375 [0.238–0.591], $p < 0.001$), dental caries (OR = 0.526 [0.333–0.831], $p = 0.006$), dentin hypersensitivity (OR = 0.470 [0.300–0.737], $p = 0.001$), missing teeth (OR = 0.164 [0.081–0.332], $p < 0.001$), periodontal problems (OR = 0.505 [0.291–0.879], $p = 0.016$), bruxism (OR = 0.331 [0.185–0.592], $p < 0.001$) and pressure to have a 'perfect' smile (OR = 0.386 [0.247–0.604], $p < 0.001$);
- group E variables (oral health behaviours): brushing teeth twice a day or more (OR = 1.984 [1.257–3.132], $p = 0.003$), brushing teeth less than once a day (OR = 0.267 [0.128–0.557], $p < 0.001$), never flossing (OR = 0.578 [0.373–0.898], $p = 0.015$), dentist visits only in urgent situations or never (OR = 0.519 [0.305–0.886], $p = 0.016$), dental check-up less than once a year (OR = 0.556 [0.355–0.870], $p = 0.010$).

Factors that are statistically significantly associated with good OHRQoL may be interrelated. To eliminate these interrelations, the multiple logistic regression method was used. The dependent variable in the statistical analysis was good OHRQoL, and the explanatory variables were characteristics indicated as statistically significant in the univariate analysis.

The results of multiple logistic regression indicate that not all groups of factors are statistically significant for young adults to achieve good OHRQoL. Statistically significant factors were
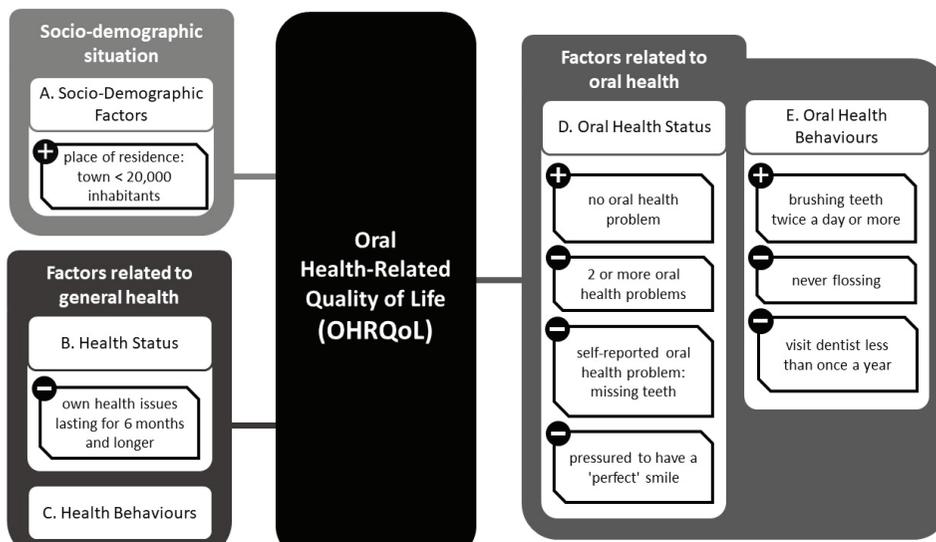
Figure 3. Barriers and enablers of good OHRQoL

variables that were related to the socio-demographic status (A), health status (B), oral health status (D) and oral health behaviours (E). In turn, none of the variables describing health behaviours (C) determined good OHRQoL (Figure 3).

Factors that positively affected the OHRQoL (enablers) were:
- Group A (Socio-demographic factors):
  – place of residence: a chance of good OHRQoL was 5 times higher in young adults from towns < 20,000 residents (OR = 4.985 [1.033–24.062], $p = 0.045$);
- Group D (Oral health status):
  – lack of oral health problems increased the chance of good OHRQoL by 2.5 times (OR = 2.523 [1.011–6.295], $p = 0.047$);
- Group E (Oral health behaviours):
  – tooth brushing frequency: brushing teeth 2 times a day or more increased the chance of good OHRQoL by nearly 2 times (OR = 1.823 [1.046–3.178], $p = 0.034$).

Barriers of good OHRQoL were:
- Group B (Health status):
  – own health issues lasting for 6 months and longer decreased the chance of good OHRQoL by 48.5% in comparison with young adults with no health issues of this kind (OR = 0.515 [0.307–0.863], $p = 0.012$);
- Group D (Oral health status):
  – coexistence of oral health problems decreased the chance of good OHRQoL by 71.2% (OR = 0.288 [0.164–0.506], $p < 0.001$);
  – missing teeth decreased the chance of good OHRQoL by 71.6% (OR = 0.284 [0.129–0.627], $p = 0.002$);
  – pressure to have 'perfect' teeth decreased the chance of good OHRQoL by 67.8% (OR = 0.322 [0.191–0.543], $p < 0.001$);
- Group E (Oral health behaviours):
  – never flossing decreased the chance of good OHRQoL by 53% (OR = 0.470 [0.276–0.801], $p = 0.005$);
  – dental check-ups less than once a year halved the chance of good OHRQoL (OR = 0.534 [0.315–0.906], $p = 0.020$).

Discussion

The main subject of this study was to determine the level of oral health-related quality of life among young adults and to analyse its predictors.

OHRQoL is a subjective self-assessment of the physical, psychological and social aspects of oral health. Contrary to clinical indicators, it is designed to determine the consequences of poor oral health from the perspective of those affected. Its application and use in dental practice can help adapt both preventive measures and treatment to the individual needs and expectations of patients and increase the participation of dental professionals in the process of improving patients' quality of life [7, 10, 29, 30].

The analyses performed in the study made it possible to provide answers to the questions posed in the Objectives.

The first question concerned the level of OHRQoL among young adults. In the study, the most common questionnaire, the Oral Health Impact Profile (OHIP-14), was used to measure OHRQoL. The mean value of OHIP-14 in the study group was 5.70 (SD = 7.15). This result was comparable to the result obtained by Chantre et al. in a study on a group of undergraduate students of the University of Lisbon, in which a score of 5.98 (SD = 6.71) was recorded [15]. Other researchers who evaluated the impact of oral health on the quality of life in persons between 18–35 years of age recorded the following mean values of OHIP-14 scores across countries worldwide: 1.92 ± 5.47 in Japan, 4.50 ± 5.14 in Brazil, 4.64 ± 8.57 in China, 6.10 ± 8.00 in Australia. The lower the OHIP-14 score, the better the OHRQoL [17, 31–33]. The highest mean values of OHIP-14, which indicated a low OHRQoL, were recorded among young adults in Nigeria, Croatia and Iran, and they amounted to 10.43 ± 7.85, 11.66 ± 8.72 and 12.5 ± 9.26, respectively [16, 34–35]. Considering the large discrepancies between the OHIP-14 results that were obtained in various studies, it should be emphasised that a comparison of our study on Polish young adults with other studies necessitates consideration of national, geographical and cultural differences, as well as differences in the value systems in the compared societies. As many as 81.2% of the respondents showed good OHRQoL. A very similar result of 89.8% was recorded in a group of Portuguese students [15].

The least satisfying domains of quality of life were physical pain, psychological discomfort and psychological disability. Psychological discomfort and physical pain were the domains which had the greatest impact on OHRQoL among Brazilian students (37.7% and 24.0%, respectively). Social disability and social handicap had the least influence on OHRQoL [31]. In a study by Sun et al. conducted on a group of students in Hong Kong, physical pain, psychological discomfort and psychological disability were the most affected OHIP-14 subscales, whereas handicap was a subscale that was not affected at all [18]. Students from Portugal also indicated psychological discomfort and physical pain as dimensions of OHIP-14 with the greatest impact

on OHRQoL [15]. Literature shows that physical pain was one of the most important aspects when analysing OHRQoL with regard to the OHIP-14 in Nigeria and China [32, 34].

The second question posed in the Objectives concerned the degree to which variables of socio-demographic status, health status and oral health status affected the level of perceived OHRQoL. According to literature, socio-demographic factors related to gender, place of residence, level of education and financial status affect the level of perceived OHRQoL [15, 36, 37]. However, in the present study, no statistically significant differences in the level of OHQoL were observed between males and females. These results were consistent with the findings of other studies, which indicate that gender was not an influencial factor of OHRQoL [18, 38–41].

In the study presented in this paper, the level of education was not a determinant of good OHRQoL. In turn, the study by Masood et al. that was performed on a group of young adults with a university degree in Malaysia showed a significantly higher impact of education on OHRQoL among respondents with a university degree, and a lower level of OHRQoL among participants with only secondary education. This may result from the increased self-awareness and self-esteem of young adults with a higher level of education [39].

The place of residence was found to be a variable that differentiated the level of OHRQoL. Those living in urban areas had lower OHIP scores than those in rural areas. A place of residence of up to 20,000 inhabitants was a factor that contributed to good OHRQoL among the respondents of our study. A study by Husain et al. revealed that the place of residence was statistically significantly related to the perceived level of oral health-related quality of life. Quality of life in rural areas was lower (an increased OHIP-14 score) compared to urban areas [42]. A study by Cohen-Carneiro et al. that was conducted in Brazil confirmed that the more remote the area, the more affected the quality of life is [43].

Although we did not observe such a relationship in our study, socio-economic factors such as low income can affect OHRQoL. Respondents with high income showed low OHIP scores in studies by other authors, which suggests better quality of life in this group than in the group of respondents with low income [42, 44, 45].

Oral health is an integral part of general health. Good OHRQoL affects the overall health and daily activity of young adults. The relationship between quality of life and health is two-way, as the state of health can also significantly affect everyday activity. The results of studies conducted worldwide indicate the existence of a relationship between oral health and the quality of life [17, 36]. Research into OHRQoL is being conducted in groups of patients suffering from various diseases and health problems related to both general health [46, 47] and oral health [48–50].

In our study, decreasing OHRQoL in young adults was associated with own health issues lasting for 6 months and longer. A study carried out at the Federal University of Parana, Brazil, showed that students' self-assessed general health (p = 0.011) was significantly associated with OHRQoL [31].

No statistically significant impact of health behaviours on the level of quality of life was observed in our study on OHRQoL among young adults. However, a study on a group of students of the University of Lisbon showed a relationship between health behaviours and OHRQoL [15].

In the present study, most respondents reported the presence of oral health problems (74.0%). Furthermore, the analyses showed that OHRQoL was strongly correlated with the occurrence of oral health problems. Similar results were obtained by Chantre et al. in a study conducted among young adults in Portugal, where the following predictors of a low level of OHQoL were reported: self-reported oral problems (current and in the past) and negative self-perception of oral health status [15]. A relationship between OHRQoL and self-reported oral problems was revealed in a study from India by Acharya and Sangam, as well as in a study from

Brazil by Gonzales-Sullcahuamán et al. [31, 37].

The present study supports the existing body of literature that suggests that incomplete dentition is a problem for the respondents and negatively affects quality of life. Respondents with missing teeth indicated good OHRQoL significantly less frequently than those who did not complain about oral health problems. According to the authors of studies conducted in the UK, Australia and Germany, among others, tooth loss negatively impacts OHRQoL [51–53]. Considering the negative consequences of tooth loss on OHRQoL, it is worth conducting public health interventions in the area of prevention and promotion of oral health in the group of young adults in Poland, which would be aimed at preserving all teeth until old age.

Our results are similar to those of Sun et al. who conducted a study on a group of young adults in Hong Kong and showed that periodontal status, as well as caries, had no impact on the OHIP-14 score [30]. In turn, a study by Yamane-Takeuchi et al. from Japan carried out among university students reported that caries was directly associated with OHRQoL [17].

The results of studies conducted around the world indicate that malocclusion could affect OHIP-14 scores. Participants with high orthodontic treatment needs showed a significantly greater negative impact on the OHRQoL score [39, 54, 55].

In our study conducted in young adults, persons who felt the pressure of having a perfect smile had a significantly lower chance of having good OHQoL. It is well known that individuals with better dental appearance generally have higher self-esteem and enjoy better social acceptance than those with dental problems. An unattractive dental appearance translates into a negative social impact [18]. Considering the above, OHRQoL can be considered the best measurement for dental treatment needs and outcomes in the field of aesthetic dentistry. Dental treatment might improve both patients' oral symptoms and emotional experiences.

In our study on OHRQoL, statistically significant differences were observed between respondents with good oral health habits in terms of proper hygiene and dental check-ups. These results are similar to those of the study carried out by Chantre et al. in which several aspects related to oral health behaviours, i.e. bad oral hygiene habits, making dental appointments only in urgent situations and not making oral health appointments due to economic reasons, were significantly related to worse OHRQoL [15]. Yamane-Takeuchi et al. also found that poor oral health behaviours were associated with worse OHRQoL [17].

In our study, the factors determining good OHRQoL among young adults were dominated by those that are subject to modification. Identification of these factors, along with an analysis of their impact on OHRQoL, is the first step in the development of public health interventions in the area of oral disease prevention and oral health promotion. Studies on oral health-related quality of life show the patient's perspective, provide additional information about health needs and they can reveal a patient's needs that have been overlooked by the dentist [30].

Limitations of the study

Our study has some limitations. Firstly, the sample is biased towards females (n = 391 of 527). Secondly, the participants were self-selected for the study. The data was gathered by means of a convenience sample from subjects who had completed an online survey. Thirdly, the data collected was based on self-assessment (e.g. body weight, height, eating habits, physical activity).

Summing up the assessment of the oral health-related quality of life and its particular domains, it is worth emphasising the generally high level of OHRQoL among young adults in the following domains: functional limitation, physical disability and handicap.

Conclusions

Oral health is not only important for general health, but it can also be used to promote general health in the population. Assessment of the quality of life related to oral health can be used by the health system as a measure of the health of the population. It allows for the identification of groups that are at risk of poor health or identification of the impact of variables of socio-demographic status, general health status, oral health status and oral health behaviours on OHRQoL. Such an approach can also make is possible to get to know a patient's perspective on their health.

The OHRQoL assessment has multiple important clinical implications. It includes a subjective assessment of the patient's own health, their functional and emotional well-being, expectations about and satisfaction with the treatment and well-being.

The findings reveal the need for health promotion to focus on factors related to the place of residence, chronic health problems and oral health-seeking behaviours. The identification of the degree of the self-assessed quality of life and its determinants should be taken into account when developing and implementing health programmes aimed at improving the health and well-being of young adults.

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