

Impact of Extroversion on Oral Health-Related Quality of Life in Prosthodontic Patients

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ABSTRACT

Background: Oral health-related quality of life (OHRQoL) is a compound model comprising individualized evaluation of one's emotional, functional and oral health. It is easily influenced by multiple variables including oral problems, cultural differences and personality traits. Where other personality traits negatively influence OHRQoL, extroversion exhibits a positive association. Contrarily, conflicting results have been reported in literature. The inconsistent results, insufficient local data and cultural differences make it imperative to further investigate. The objective of the study was to determine a correlation between extroversion and OHRQoL in prosthodontic patients.

Methodology: This cross-sectional study was conducted in Prosthodontics Department of Islamic International Dental Hospital, Islamabad from May 2018 to April 2019. Sample size was calculated to be 270 with 5% significance level and Spearman correlation coefficient of 0.17. However, 305 patients were included in this study. After obtaining informed consent and recording demographic data, Oral Health Impact Profile-14 (OHIP-14) and Eysenck Personality Questionnaire–Revised Short-scale (EPQ-RS) were used to collect the required data and categorize patients.

Results: The bivariate correlation analysis revealed extroversion to be negatively associated ($r = -0.220$) with OHIP score. It depicts that the more extrovert an individual, the lower the OHIP score (better OHRQoL) and vice versa. Effect modifier analysis revealed inconsistent correlation results for extroversion.

Conclusion: A positive correlation has been established between Extroversion and OHRQoL, with inconsistent results after controlling effect modifiers.

Keywords: Extroversion, Oral Health, Personality, Quality of life

Authors' Contribution:

¹Conception; Literature research; manuscript design; ^{2,3}Critical analysis and manuscript review; ⁴Data collection; ⁵Manuscript Editing; ⁶Data analysis.

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Introduction

Oral health-related quality of life (OHRQoL) is a compound model comprising individualized evaluation of one's emotional, functional and oral health.¹ OHRQoL measures have been used in dentistry to determine the inter-play between personality traits, quality of life, patient's dental perceptions and satisfaction level.²

It is important to consider OHRQoL because oral problems have been known to influence the psychosocial and functional health of a person considerably. Owing to its dynamic nature, OHRQoL is influenced by socio-demographic factors, cultural variances and personality traits and therefore may change with time.³

Personality has been reported to consistently relate with Quality of Life. Interestingly, the moderate impact of personality usually prevails over that of socio-demographic and even clinical variables.⁴ This highlights the predictive value of personality traits towards quality of life and general functioning in the discipline of medicine.⁵ Several studies showed relationship between quality of life and patient personality in the field of dentistry. The study conducted by Takeshita et al.² reported an association between personality traits and OHRQoL, irrespective of the dental status and oral function. OHRQoL is reported to be negatively associated with neuroticism and positively associated with extroversion. Such impact of personality traits may be caused by their strong correlation with sense of purpose, which itself is positively associated with self-reported health. This makes the patients prone to oral disease and alters their disease perceptions.⁶ Another study conducted on undergraduate medical students found personality traits to be influencing both self-esteem and OHRQoL significantly.⁷ Similar results have been reported in the field of Orthodontics by Al Nazeh et al.⁸ who found extroversion, openness, and conscientiousness

personality factors contributing towards OHRQoL. In the field of Prosthodontics, Reissmann, et al.⁹ concluded that substantially improved OHRQoL, usually observed with implant treatment, is not independent of patient's clinical and psychosocial characteristics. However, contrary to all the above mentioned studies, Menassa et al.¹⁰ found no such correlation. They found that in patients receiving implant-supported mandibular overdenture, OHRQoL improved regardless of their personality traits or other clinical variables.

The objective of the study was to determine a correlation between extroversion and OHRQoL in prosthodontic patients. The gathered information will provide an insight into the importance of evaluating patient personality traits prior to comprehensive prosthodontic treatment, since they may be influential to their OHRQoL, by either altering their perspectives, expectations, or treatment outcomes. Since more dental visits could also be expected from people with certain personality traits, this investigation will further aid in understanding a public health burden. It will therefore be advantageous if the dental practitioner can foresee these problems, predict patient's tolerance and responses to a prescribed therapy and ultimately improve their OHRQoL.

Methodology

This cross-sectional study was conducted at Prosthodontics department of Islamic International Dental Hospital Islamabad from May 2018 till April 2019. With reference to the correlation coefficient values from the study by Takeshita et al.², sample size for extroversion was calculated to be 270 with significance level 5% and spearman correlation coefficient of 0.17. However, 305 patients were included in this study. The sampling technique followed was consecutive non-probability.

Formal approval was obtained from the Ethical Review Committee of the institute. The study sample was collected from the patients referred to the department of Prosthodontics for treatment purpose. Informed consent was obtained from the patients before being included in the study and interviewed. Male and female patients ranging in age from 21 years to 65 years presenting with partial or complete tooth loss were included while patients who were old-denture wearers, mentally handicap, non-cooperative, unable to comprehend or respond to questions efficiently and those undergoing anti-depressant therapy were excluded from the study. After relevant clinical and radiographic examination, a provisional diagnosis was made followed by a tentative treatment plan. All interviews were conducted by the principal investigator prior to any prosthodontic procedure to overcome any treatment-related bias.

First, basic demographic information was recorded in a self-designed proforma. Patients were inquired about their education level, socioeconomic status and locality. The data helped to place patients into their corresponding groups. According to age, patients were categorized into three groups: Group I (21-35 years), Group II (36-50 years) and Group III (51-65 years). Four groups were proposed on the basis of education level: Illiterate, Under-graduate, Graduate and Post-graduate. Similarly, socioeconomic status was categorized into three groups: Low class (monthly income less than 50K), Middle class (monthly income from 50K to 150K) and High class (monthly income above 150K).

After the first proforma, the following 2 questionnaires were filled: Oral Health Impact Profile-14 (OHIP-14) and Eysenck Personality Questionnaire-Revised Short-scale (EPQ-RS). All the questions were translated and explained to the patients in urdu language. In order to assess the OHRQoL, every patient was asked 14 questions from the OHIP-14 standard questionnaire. Patients

responses were recorded on a four-point likert scale, either as Never (frequency = 0%), Sometimes (frequency ≤ 50%), Often (frequency = 50-75%) or Always (frequency = 75-100%). Each question was scored independently. Final OHIP score was obtained by summing up the individual scores of all the questions. It could range from minimum of 0 to maximum of 42. This OHIP score was used to categorize OHRQoL into three groups i.e. Good (score of 0 - 14), Average (score of 15 - 28) and Poor (score of 29 - 42).

After the completion of the first questionnaire, every patient was asked questions from the EPQ-RS standard questionnaire which originally consists of 48 questions for assessment of four major personality traits (12 questions per trait) including neuroticism, extroversion, psychoticism and lie. Only extroversion was assessed for this study. The data was recorded and analyzed on SPSS (Version 23). Descriptive statistics were calculated for both quantitative and qualitative variables. Means with standard deviations were calculated for the quantitative variables i.e. age, OHIP score, and extroversion score. Frequencies with percentages were calculated for qualitative variables i.e. gender, age groups, education level, socioeconomic status, locality, oral health-related quality of life (OHRQoL) and extroversion. Bivariate correlation analysis was done between extroversion and OHIP score. Post-stratification correlation was used to evaluate underlying influence of the effect modifiers on the statistically obtained relationship between oral health related quality of life and extroversion. P value of 0.05 or less was considered statistically significant.

Results

The 305 patients in the age range of 21 years to 65 years, with a mean age of 40.47 years and standard deviation of 15.84 participated in the study. The OHIP score obtained by the participants ranged from 0 to 37 with a mean of 12.26 and standard deviation of 8.67. The extroversion score ranged from 0 to 12 with a mean of 7.16 and standard deviation of 3.15. The study included 122 (40%) male and 183 (60%) female participants. According to age groups, more than half participants i.e. 159 (52%) were from Group I (21-35 years) followed by 113 (37%) participants from Group III (51-65 years). Least participation was from Group II (36-50 years) which comprised of only 33 (11%) patients. Based on education level, majority of the sample was well educated. Only 16 (5.2%) participants were illiterate and 94 (30.8%) were under-graduates. 137 (45%) were graduates while 58 (19%) were post-graduates. On the basis of socioeconomic status, majority of the sample size i.e. 181 (59.3%) candidates belonged to the middle class families, 89 (29.2%) participants were from poor socioeconomic background while only 35 (11.5%) were from high class status. Quality of Life assessment returned promising results. Good OHRQoL was observed in majority of participants i.e. 188 (61.7%), whereas only 19 (6.2%) showed poor OHRQoL. Average OHRQoL was exhibited by 98 (32.1%) participants. In the five categories of extroversion, 32 (10.5%) participants were assessed as 'introvert', 57 (18.7%) showed 'tendency towards introversion', 32 (10.5%) were 'average', 99 (32.4%) showed 'tendency towards extroversion' while 85 (27.9%) were 'extrovert'.

In order to find out the relationship between OHRQoL and extroversion, a bivariate correlation analysis was performed in SPSS (version 23) between OHIP score and the personality trait under observation i.e. extroversion. Extroversion was found to be negatively associated with OHIP score

($r_s = -0.220$). It shows that the more extrovert the individual, the lower the OHIP score which in turn represents a better OHRQoL. P-value (0.000) depicts the highly significant relationship between these two variables.

In order to address the influence of effect modifiers, stratification of data was done followed by correlation analysis of OHRQoL with extroversion. The first effect modifier under observation was gender. As depicted in Table I, association of OHRQoL with Extroversion remained significant after data stratification.

Table II depicts the correlation analysis after data stratification according to the three devised age groups. Unlike the significant association observed in two age groups i.e. Group II (36-50 years) and Group III (51-65 years), Group I (21-35 years) showed insignificant association between extroversion and OHRQoL.

After data stratification into four groups according to Education Level, correlation analysis revealed that OHRQoL was still significantly associated with extroversion in two groups i.e. Undergraduates and Postgraduates (Table III). Illiterates and Graduates did not exhibit significant association between Extroversion and OHRQoL.

As shown in Table IV, correlation analysis revealed that OHRQoL was still significantly associated with Extroversion in two groups (Middle class and High class). Individuals from Low class socio-economic status did not exhibit significant association between Extroversion and OHRQoL.

Table I: Correlation between OHRQoL and Extroversion with Gender as Effect Modifier						
Extroversion	OHRQoL in Males (n = 122)			OHRQoL in Females (n = 183)		
	Good	Average	Poor	Good	Average	Poor
Introvert	7 (5.7%)	4 (3.3%)	0 (0.0%)	6 (3.3%)	7 (3.8%)	8 (4.4%)
Tendency introversion	18 (14.8%)	6 (4.9%)	2 (1.6%)	12 (6.6%)	16 (8.7%)	3 (1.6%)
Average	6 (4.9%)	2 (1.6%)	3 (2.5%)	15 (8.2%)	6 (3.3%)	0 (0.0%)
Tendency extroversion	30 (24.6%)	7 (5.7%)	2 (1.6%)	34 (18.6%)	25 (13.7%)	1 (0.5%)
Extrovert	33 (27.0%)	2 (1.6%)	0 (0.0%)	27 (14.8%)	23 (12.6%)	0 (0.0%)
Total	94 (77.0%)	21 (17.2%)	7 (5.7%)	94 (51.4%)	77 (42.1%)	12 (6.6%)
Correlation Coefficient	$r^s = -0.348$			$r^s = -0.161$		
Significance	$P = 0.000$			$P = 0.030$		

Table II: Correlation between OHRQoL and Extroversion with Age Group as Effect Modifier									
Extroversion	OHRQoL in Group I (n = 159)			OHRQoL in Group II (n = 33)			OHRQoL in Group III (n = 113)		
	Good	Avg.	Poor	Good	Avg.	Poor	Good	Avg.	Poor
Introvert	9 (5.7%)	0 (0.0%)	1 (0.6%)	0 (0.0%)	2 (6.1%)	6 (0.0%)	4 (3.5%)	9 (8.0%)	1 (0.9%)
Tendency introversion	15 (9.4%)	9 (5.7%)	0 (0.0%)	6 (18.2%)	2 (6.1%)	2 (6.1%)	9 (8.0%)	11 (9.7%)	3 (2.7%)
Average	15 (9.4%)	3 (1.9%)	0 (0.0%)	2 (6.1%)	2 (6.1%)	0 (0.0%)	4 (3.5%)	3 (2.7%)	3 (2.7%)
Tendency extroversion	36 (22.6%)	19 (11.9%)	0 (0.0%)	3 (9.1%)	5 (15.2%)	0 (0.0%)	25 (22.1%)	8 (7.1%)	3 (2.7%)
Extrovert	33 (20.8%)	19 (11.9%)	0 (0.0%)	2 (6.1%)	1 (3.0%)	0 (0.0%)	25 (22.1%)	5 (4.4%)	0 (0.0%)
Total	108 (67.9%)	50 (31.4%)	1 (0.6%)	13 (39.4%)	12 (36.4%)	8 (24.2%)	67 (59.3%)	36 (31.9%)	10 (8.8%)
Correlation Coefficient	$r^s = 0.132$			$r^s = -0.563$			$r^s = -0.533$		
Significance	$P = 0.096$			$P = 0.001$			$P = 0.000$		

Extroversion	OHRQoL in Illiterates (n = 16)			OHRQoL in Undergraduates (n = 94)			OHRQoL in Graduates (n = 137)			OHRQoL in Postgraduates (n = 58)		
	Good	Avg.	Poor	Good	Avg.	Poor	Good	Avg.	Poor	Good	Avg.	Poor
Introvert	0 0.0%	1 6.3%	0 0.0%	1 1.1%	3 3.2%	7 7.4%	10 7.3%	5 3.6%	1 0.7%	2 3.4%	2 3.4%	0 0.0%
Tendency introversion	0 0.0%	2 12.5%	0 0.0%	5 5.3%	6 6.4%	5 5.3%	19 13.9%	7 5.1%	0 0.0%	6 10.3%	7 12.1%	0 0.0%
Average	1 6.3%	0 0.0%	0 0.0%	5 5.3%	4 4.3%	3 3.2%	12 8.8%	4 2.9%	0 0.0%	3 5.2%	0 0.0%	0 0.0%
Tendency extroversion	2 12.5%	5 31.3%	1 6.3%	22 23.4%	16 17.0%	1 1.1%	24 17.5%	7 5.1%	1 0.7%	16 27.6%	4 6.9%	0 0.0%
Extrovert	2 12.5%	2 12.5%	0 0.0%	15 16.0%	1 1.1%	0 0.0%	29 21.2%	18 13.1%	0 0.0%	14 24.1%	4 6.9%	0 0.0%
Total	5 31.3%	10 62.5%	1 0.6%	48 51.1%	30 31.9%	16 17.0%	94 68.6%	41 29.9%	2 1.5%	41 70.7%	17 29.3%	0 0.0%
Correlation Coefficient	$r^s = -0.215$			$r^s = -0.552$			$r^s = -0.034$			$r^s = -0.269$		
Significance	$P = 0.425$			$P = 0.000$			$P = 0.695$			$P = 0.041$		

Extroversion	OHRQoL in Low Class (n = 89)			OHRQoL in Middle Class (n = 181)			OHRQoL in High Class (n = 35)		
	Good	Avg.	Poor	Good	Avg.	Poor	Good	Avg.	Poor
Introvert	1 (1.1%)	3 (3.4%)	1 (1.1%)	9 (5.0%)	5 (2.8%)	7 (3.9%)	3 (8.6%)	3 (8.6%)	0 (0.0%)
Tendency introversion	10 (11.2%)	4 (4.5%)	1 (1.1%)	15 (8.3%)	15 (8.3%)	4 (2.2%)	5 (14.3%)	3 (8.6%)	0 (0.0%)
Average	5 (5.6%)	2 (2.2%)	1 (1.1%)	11 (6.1%)	5 (2.8%)	2 (1.1%)	5 (14.3%)	1 (2.9%)	0 (0.0%)
Tendency extroversion	21 (23.6%)	16 (18.0%)	2 (2.2%)	40 (22.1%)	14 (7.7%)	1 (0.6%)	3 (8.6%)	2 (5.7%)	0 (0.0%)
Extrovert	9 (10.1%)	13 (14.6%)	0 (0.0%)	42 (23.2%)	11 (6.1%)	0 (0.0%)	9 (25.7%)	1 (2.9%)	0 (0.0%)
Total	46 (51.7%)	38 (42.7%)	5 (5.6%)	117 (64.6%)	50 (27.6%)	14 (7.7%)	25 (71.4%)	10 (28.6%)	0 (0.0%)
Correlation Coefficient	$r^s = 0.059$			$r^s = -0.316$			$r^s = -0.445$		
Significance	$P = 0.580$			$P = 0.000$			$P = 0.007$		

Discussion

The correlation between QoL and personality has rarely been explored in the discipline of oral health as opposed to multiple researches encompassing various medical conditions which emphasize the role of personality in shaping a patient's QoL. The personality trait under observation i.e. extroversion is linked with a sociable nature and lack of stressful sentiments. Extroverts tend to exhibit a positive perception of their health status. The influence of extroversion on OHRQoL fluctuates across existent researches but is generally theorized to improve coping and dealing with bothersome symptoms.¹¹

On the basis of gender, this study returned consistent findings with many other investigations depicting a poorer oral health perception in women.¹² On the contrary, Sierwald et al.¹³ published research advocating males to be more sensitive to oral problems. The same research also concludes that OHRQoL assessment is independent of age which contradicts the findings in this study where a significant relationship between age groups and OHRQoL was observed. The middle age group i.e. Group II (36-50 years) exhibited poorer OHRQoL in comparison to the age groups at both extremes. This finding has questionable validity due to least representation of participants in this age group. However, it does contradict the results of Lodhi et al.¹⁴ who found geriatric individuals to be having poorer OHRQoL. The relationship between the education level and OHIP score is in line with past researches representing a significant role of education to predict OHRQoL.² Education level was found to be directly related to OHIP score with educated individuals exhibiting better OHRQoL. On the contrary, the association between the OHIP score and socioeconomic status is insignificant, making it inconsistent with previous studies which indicated its role in the prediction of OHRQoL.²

It has been an established fact that particular personality traits exhibit a significant impact on

responses to self-reported items. In this study, it was found that an association between oral health related quality of life and extroversion does exist. Extroversion did affect the OHRQoL but with inconsistent results after controlling effect modifiers. The inconsistency can be explained by the findings of Bonafe et al.¹⁵ who reported no significant association between extroversion and OHRQoL.

Multiple studies advocate that extrovert people, regardless of oral status, tended to score high on OHRQoL index.^{2, 16} However this recommendation was inconsistent with the surprising observation by Lin et al.¹² who found no significant correlation between all dimensions of OHIP-14 and extroversion. Perhaps such contradicting studies explain the mixed results obtained in our study when the initially significant positive correlation established between OHRQoL and extroversion disappeared after the application of post-stratification effect modifier analysis. After adding effect modifiers, extroversion showed inconsistent results with all effect modifiers except gender. However, the disappearance of significant association observed in younger individuals 'Group I' (21-35years) is in line with the findings of Aydogan¹⁷, Clijmans et al.¹⁸, Gabriella et al.¹⁶ and Takeshita et al.² where the first researcher found no significant effect of extroversion on OHRQoL in adolescents while the rest reported significant association in adults and elderly.

These results should be taken into account when considering the approach towards a patient. The data contributes a clearer understanding of personality traits specifically extroversion and its impact on QoL in the field of oral health. Personality traits may influence an individual's reaction to symptoms, contributing to sickness state and, thus relating to one's OHRQoL. With the passage of time, the demands of dental patients especially geriatric individuals are turning out to be ever more complex, so it is valuable to evaluate personality traits of a

patient before dental treatment in order to foresee patient response and expectations affiliated with the devised treatment plan. Another characteristic that may be influenced by personality traits is the compliance exhibited by the patient. Understanding patient personality traits may aid to determine the most feasible therapy in accordance with their tolerance threshold, since more dental visits could also be expected from people with certain personality traits e.g. introversion. This will help us formulate a better approach in prevention of public health burden and efficient utilization of health resources.

Some limitations of this study must be considered. Cross-sectional study design, although less demanding and low-cost, can only establish relation between a condition and one of its possible causative factor, rather than a “cause-and-effect” association. Had the financial resources and time allowed, a longitudinal study would have been more appropriate to capture the change in attitude and behavior over time, enabling better identification of the relationships among different variables. Another limitation was the exclusion of handicapped, non-cooperative and patients who were unable to respond, making it impossible to collect a sample data that truly represents general population. Further studies need to be conducted to confirm the modification of relationship between extroversion and OHRQoL by other variables along with assessment of other personality traits as well.

Conclusion

Correlation existed between personality traits and oral health-related quality of life in prosthodontics patients. Extroversion correlates positively with the OHRQoL but with inconsistent results after controlling effect modifiers

References

1. John MT. Foundations of oral health-related quality of life. *J Oral Rehabil.* 2021; 48: 355– 359. doi: 10.1111/joor.13040
2. Takeshita H, Ikebe K, Kagawa R, Okada T, Gondo Y, Nakagawa T, et al. Association of personality traits with oral health-related quality of life independently of objective oral health status: a study of community-dwelling elderly Japanese. *J Dent.* 2015;43(3):342-9. doi: 10.1016/j.jdent.2014.12.011.
3. Sun L, Wong HM, McGrath CPJ. The factors that influence oral health-related quality of life in 15-year-old children. *Health Qual Life Outcomes.* 2018 Jan 18;16(1):19. doi: 10.1186/s12955-018-0847-5.
4. Huang I, Lee JL, Ketheeswaran P, Jones CM, Revicki DA, Wu AW. Does personality affect health-related quality of life? A systematic review. *PLoS One.* 2017 Mar 29;12(3):e0173806. doi: 10.1371/journal.pone.0173806.
5. Ridgewell C, Blackford JU, McHugo M, Heckers S. Personality traits predicting quality of life and overall functioning in schizophrenia. *Schizophr Res.* 2017 Apr;182:19-23. doi: 10.1016/j.schres.2016.10.007.
6. Hill PL, Edmonds GW, Hampson SE. A purposeful lifestyle is a healthful lifestyle: Linking sense of purpose to self-rated health through multiple health behaviors. *J Health Psychol.* 2019;24(10):1392-1400. doi: 10.1177/1359105317708251.
7. Oancea R, Timar B, Papava I, Cristina BA, Ilie AC, Dehelean L. Influence of depression and self-esteem on oral health-related quality of life in students. *J Int Med Res.* 2020;48(2):1-11. doi: 10.1177/0300060520902615.
8. Al Nazeah AA, Alshahrani I, Badran SA, Almoammar S, Alshahrani A, Almomani BA, et al. Relationship between oral health impacts and personality profiles among orthodontic patients treated with Invisalign clear aligners. *Sci Rep.* 2020;10(1):20459. doi: 10.1038/s41598-020-77470-8.
9. Reissmann DR, Dard M, Lamprecht R, Struppek J, Heydecke G. Oral health-related quality of life in subjects with implant-supported prostheses: A systematic review. *J Dent.* 2017 Oct;65:22-40. doi: 10.1016/j.jdent.2017.08.003.
10. Menassa M, de Grandmont P, Audy N, Durand R, Rompre P, Emami E. Patients' expectations, satisfaction, and quality of life with immediate loading protocol. *Clin Oral Implants Res.* 2016;27(1):83-9. doi: 10.1111/clr.12515.
11. Herzberg PY, Lee SJ, Heussner P, Mumm FHA, Hilgendorf I, von Harsdorf S, et al. Personality influences quality-of-life assessments in adult patients

- after allogeneic hematopoietic SCT: results from a joint evaluation of the prospective German Multicenter Validation Trial and the Fred Hutchinson Cancer Research Center. *Bone Marrow Transplant.* 2013;48(1):129-34. doi: 10.1038/bmt.2012.83.
12. Lin F, Ye Y, Ye S, Wang L, Du W, Yao L, et al. Effect of personality on oral health-related quality of life in undergraduates. *Angle Orthod.* 2018;88(2):215-20. doi: 10.2319/051017-322.1.
 13. Sierwald I, Reissmann D, John MT. Assessing OHRQoL using OHIP: impact of age and gender. IADR/AADR/CADR General Session. 2011 San Diego, California.
 14. Lodhi FS, Montazeri A, Nedjat S, Mahmoodi M, Farooq U, Yaseri M, et al. Assessing the quality of life among Pakistani general population and their associated factors by using the World Health Organization's quality of life instrument (WHOQOL-BREF): a population based cross-sectional study. *Health Qual Life Outcomes.* 2019;17(1):9. doi: 10.1186/s12955-018-1065-x.
 15. Bonafé E, Rezende M, Machado MM, Lima SNL, Fernandez E, Baldani MMP, et al. Personality traits, psychosocial effects and quality of life of patients submitted to dental bleaching. *BMC Oral Health.* 2021;21(1):7. doi: 10.1186/s12903-020-01370-6.
 16. Gabriella D, Klemens R, Xiao-Hui RF, Corinna B, Eva H. Effect of personality traits on the oral health related quality of life patients with oral lichen planus undergoing treatment. *Clin Oral Investig.* 2021;25(4):2381-9. doi: 10.1007/s00784-020-03561-5.
 17. Aydoğan C. Extraversion and openness to experience moderate the relationship between orthodontic treatment need and oral health related quality of life in adolescents. *Angle Orthod.* 2018;88(5):617-23. doi: 10.2319/103117-737.1.
 18. Clijmans M, Lemiere J, Fieuws S, Willems G. Impact of self-esteem and personality traits on the association between orthodontic treatment need and oral health-related quality of life in adults seeking orthodontic treatment. *Eur J Orthod.* 2015;37(6):643-50. doi: 10.1093/ejo/cju092.