

IMPACT OF E-CIGARETTES USE ON THE ORAL HEALTH-RELATED QUALITY OF LIFE AMONG YOUNG PEOPLE IN METROPOLITAN LIMA

Impacto en la calidad de vida relacionada a la salud oral del uso de cigarrillos electrónicos en los jóvenes de Lima Metropolitana

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ABSTRACT

Aim: To determine the effects of e-cigarette use on oral health-related quality of life (OHRQOL) in young people in Metropolitan Lima.

Materials and Methods: This observational, analytical and cross-sectional study was performed with 189 individuals (age, 18–29 years) who used electronic cigarettes. The OHIP-Sp5 instrument was used to assess OHRQOL.

Results: The use of e-cigarettes was higher among male participants (47.79%) than that among the female participants (26.32%). The mean OHRQOL scores of individuals who did and did not use e-cigarettes were 3.17 (2.26) and 3.12 (2.47), respectively. These scores for people who did and did not use mouthwash were 2.92 (2.34) and 3.57 (2.43), respectively. Regarding orofacial pain 2.65% participants frequently reported “painful discomfort” and 7.41% of the young people presented such discomfort of orofacial aspect “frequently.”

Conclusions: Recording e-cigarette uses and frequency in patients’ medical records is important, as well as incorporating educational strategies to reduce e-cigarette consumption and avoiding harmful effects on general health.

Keywords: *Vaping; Electronic nicotine delivery systems; Young adult; Quality of life, Life style; Oral health.*

RESUMEN

Objetivo: Evaluar el impacto en la calidad de vida relacionada a la salud oral del uso de cigarrillos electrónicos en los jóvenes de Lima Metropolitana.

Materiales y Métodos: Se realizó un estudio observacional, analítico y transversal en un total de 189 jóvenes con edades comprendidas de 18 a 29 años que son usuarios de cigarrillos electrónicos. Para evaluar la calidad de vida relacionada a la salud oral se utilizó el instrumento “OHIP-Sp5”.

Resultados: Se determinó que los participantes del sexo masculino (47.79%) son los que más utilizan el cigarrillo electrónico en comparación a las participantes del sexo femenino (26.32%). Se observó una calidad de vida relacionada a la salud oral media de 3,17 (2,26) para los usuarios de cigarrillos electrónicos, mientras que para los no usuarios de cigarrillos electrónicos la media fue de 3,12 (2,47). Asimismo, para los que usan enjuagues bucales se encontró una media de 2.92(2.34), a diferencia de los que no hacían uso del mismo que presentaban peor calidad de vida relacionada con la salud oral con una media de 3.57(2.43). En cuanto a dolor orofacial el 2.65% de los participantes referían “molestias dolorosas” a menudo y el 7.41% de los jóvenes presentaban dicho disconfort de la apariencia orofacial “a menudo”.

Conclusión: El registro del uso y frecuencia del cigarrillo electrónico en la historia clínica de los pacientes es de suma importancia, así como incorporar estrategias educativas para reducir el consumo de los vapeadores y evitar efectos nocivos en la salud general.

Palabras Clave: *Cigarrillos electrónicos; Sistemas electrónicos de liberación de nicotina; Jóvenes; Calidad de vida; Estilo de vida; Salud bucal.*

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CITE AS:
Vargas-Claudio F, Castilla-Minaya O &, Leon-Rios X. Impact of e-cigarettes use on the oral health-related quality of life among young people in Metropolitan Lima. *J Oral Res.* 2023; 12(1): 182-194. doi:10.17126/joralres. 2023.016

Received: February 16, 2022
Accepted: April 21, 2022
Published online: May 3, 2023
ISSN Print 0719-2460
ISSN Online 0719-2479.

INTRODUCTION

The term “*quality of life*”—coined decades ago and has since gained popularity—is defined as the quality of a person’s living conditions and the satisfaction experienced with their living conditions, combining both objective and subjective elements calculated according to personal values, aspirations, and expectations. For young adults, the quality of life is influenced by biological, psychological, and social changes that can generate crises, conflicts, and contradictions. Furthermore, their transition to adulthood is often hindered by the healthcare services available, aside from other factors such as poverty and accessibility.¹ Quality of life is related to oral health, which involves the functions performed by the mouth—*i.e.*, facial expression, language, chewing, swallowing, salivation, and sense of taste—and it is considered a good indicator of individuals’ quality of life, and personal and social well-being. Oral health significantly improves factors such as self-esteem, aesthetics, social communication, and self-perception in young adults.^{1,2}

Patterns that can impact oral health include consumption of alcohol and various forms of cigarettes, such as tobacco and electronic cigarettes (e-cigarettes).³ E-cigarette use—for recreation and smoking cessation—has become popular in recent years. These devices consist of an atomizer with fixed resistance for heat generation, a battery chamber with fixed voltage, and a liquid reservoir that can be filled with products commonly referred to

as “*e-juice*” or “*e-liquid*.” These products typically contain a combination of chemical products with desired volatility—*i.e.*, often a mixture of propylene glycol, glycerol, and water, along with varying amounts of nicotine, flavoring, and coloring agents.⁴

The main component in many e-cigarettes is nicotine, which plays a pathogenic role in several disorders of the oral cavity—including tooth loss—considering that it has the capacity to demineralize the tooth.⁵ A study in the past has suggested that these devices may include other components that lead to oral inflammation and senescence of periodontal fibroblasts, which can lead to periodontal disease and poor oral hygiene.⁶

Several tools are available to assess oral health-related quality of life (OHRQOL) and gauge subjects’ self-perception of their oral health status, whether possible or negative. One widely used instrument to assess OHRQOL is the OHIP (Oral Health Impact) questionnaire in its various variants, which has research supporting its validity. A systematic review by Simancas-Pallares *et al.*,⁷ on the perception measures of oral health in general identified several questionnaires that essentially contained the following four dimensions: oral function, orofacial appearance, orofacial pain, and psychosocial impact. Therefore, in its various versions—especially OHIP-5—OHIP can be considered a valid instrument with one item for each of the four mentioned dimensions that can be used for both patients and health professionals for research purposes.⁷

Yang *et al.*,⁸ compared case reports between patients who smoked tobacco and those who

used e-cigarettes, revealed an increased risk of deterioration of periodontal, dental, and gingival health, as well as the oral microbiota, in both groups. However, tobacco smokers presented symptoms in the mouth and throat.

The prevalence of electronic cigarette use in Peru was 12.5%, with a higher prevalence among men.⁹ The aim of this study was to investigate the OHRQOL and its relationship with the consumption of e-cigarettes among young people in Metropolitan Lima during 2021.

MATERIALS AND METHODS

Study Design and Sample

This observational, analytical, cross-sectional study was performed during 2021.

Adults from Metropolitan Lima

The sample comprised 189 young adults from Metropolitan Lima during the year 2021. To determine the sample size, the means comparison formula was used, using previously reported data.¹⁰ The calculations were performed using Epidat[®] version 4.2 software, with a confidence level of 95%, a power of 80%, and a ratio of 1. The indicated sample size was 110 individuals.

The response rate was 60% and the survey was, therefore, sent to at least 176 individuals. Sampling was non-probabilistic by convenience.

Inclusion and Exclusion Criteria

When conducting this investigation, young adults (age, 18–29 years), male and female,

residing in Metropolitan Lima, who had used cigarettes in the last 12 months, and who agreed to participate in the research through informed consent were included.

Pregnant women and young people who were receiving medical treatment due to diagnostic systemic diseases and/or those who were undergoing comprehensive dental treatment were excluded.

Ethical Considerations

Approval for this study was obtained from the Ethics Committee of the Department of Health Sciences of the Peruvian University of Applied Sciences (PI 440-20) (Annex 1).

Participation was entirely voluntary, and participants were requested to provide informed consent. Likewise, names and surnames were not used, so each survey was coded.

Assessment of Oral Health-Related Quality of Life

OHRQOL was assessed using the OHIP-Sp5 questionnaire in its Spanish-translated version.⁷

This questionnaire exhibits a Cronbach's alpha reliability coefficient of 0.83. The questionnaire consisted of five questions divided into 4 domains, using a five-point Likert-type scale ranging from 0 to 4 for each question, with a response category of:

- 0=never;
- 1=almost never;
- 2=occasionally;
- 3=often;
- and 4= very often.

The maximum score attainable was 20, with higher scores indicating a lower OHRQOL.

Assessment of the E-cigarettes Consumption

The following self-reporting question was used to identify users of electronic cigarettes: “Do you use or consume e-cigarettes?”

The response options were “yes” or “no.” Furthermore, the frequency of use was determined through the question “How often do you use or consume e-cigarettes?”: with response categories of “every day,” “some days,” or “never.”

Internal Validation of the Questionnaire

An internal validation was performed by an expert panel made up of 5 members. The degree of agreement among the experts was measured via Aiken’s V statistic, obtaining a value of 0.99, which demonstrated adequate content validation.

A pilot test involving 20 young people from Metropolitan Lima was performed to confirm the comprehensibility of the questionnaire items, which had already been approved through expert judgment.

A Cronbach’s Alpha value of 0.70–0.73 was achieved for the instrument with the answers obtained, thereby determining good reliability of the instrument. Additionally, the “test–retest” technique of the questionnaire responses was conducted at both times using Spearman’s correlation for the OHIP-Sp5, obtaining a Kappa value of 0.54 for the electronic cigarette consumption variable, which yielded a value of 0.79 - which reflects an acceptable correlation.

Data Collection

Regarding participant selection, the survey was published in different groups of electronic cigarette users on Facebook where in

participants accessed the link to the questionnaire created using Google Forms®.

Data Analysis

Data were entered into a Microsoft Excel® table (version 2021), where collected information was examined and verified. Data analysis was performed using Stata® statistical software (version 16.00).

Descriptive measures, including absolute frequencies, relative mean, and standard deviation, were calculated for the qualitative study variables. For non-normally distributed quantitative variables, median and interquartile range were used. Bivariate analysis involved the use of Mann–Whitney U test and Kruskal–Wallis test.

RESULTS

The 189 people who met the inclusion criteria showed no significant association between the consumption of e-cigarettes and OHR-QOL. Table 1 shows the general characteristics and oral health habits of participants. From the total sample, it was observed that 76 people were female (40.21%) and 113 (59.76%) were male. The participants of the study had a mean age of 22 years.

Regarding oral health habits, all reported using toothpaste and toothbrush; however, 36.51% and 33.33% did not use dental floss or mouthwash, respectively. Regarding the consumption of e-cigarettes, 39.15% of the total study population used these devices and only 10.05% reported using them every day.

Table 2 shows the results of the OHRQOL evaluation in young people in Metropolitan Lima during 2021.

Table 1. General Characteristics and Oral Health Habits of the 189 Participating Young Adults.

| Variables | | n | (%) |
|--|-----------------------------|-----|---------|
| AGE* | | 22 | (24–21) |
| Sex | Male | 113 | (59.79) |
| | Female | 76 | (40.21) |
| Residence | South Lima | 35 | (18.52) |
| | Central Lima | 127 | (67.20) |
| | North Lima | 14 | (7.41) |
| | East Lima | 13 | (6.88) |
| Education | Secondary | 19 | (10.05) |
| | Non-university higher | 26 | (13.76) |
| | University higher | 135 | (71.43) |
| | Graduate | 9 | (4.76) |
| Family monthly income | Level A: ≥12 661 soles | 54 | (28.57) |
| | Level B: 7,021–12,660 soles | 39 | (20.63) |
| | Level C: 3,971–7,020 soles | 47 | (24.87) |
| | Level D: 1,301–3,970 soles | 21 | (11.11) |
| | Level E: <1,300 soles | 28 | (14.81) |
| Occupation | Employer | 9 | (4.76) |
| | Self-employed | 52 | (27.41) |
| | Employee | 36 | (19.05) |
| | Other ^Ψ | 92 | (48.68) |
| E-CIGARETTE CONSUMPTION | | | |
| Use | Yes | 74 | (39.15) |
| | No | 115 | (60.85) |
| Frequency | Never | 115 | (60.85) |
| | Some days | 55 | (29.10) |
| | Every day | 19 | (10.05) |
| HABITS IN ORAL HEALTH | | | |
| Use of toothbrush and toothpaste | Yes | 189 | (100) |
| Flossing | No | 69 | (36.51) |
| | Yes | 120 | (63.49) |
| Use of mouthwash | No | 63 | (33.33) |
| | Yes | 126 | (66.67) |
| Frequency of daily tooth brushing | Less than twice a day | 12 | (6.35) |
| | More than twice a day | 177 | (93.65) |
| Visit to the dentist in the last year for follow up | Yes | 123 | (65.08) |
| | No | 66 | (34.92) |

*: Median (interquartile range) . ^Ψ: Other: Worker, unpaid family worker, household worker.

Table 2. Assessment of Oral-Health-Related Quality of Life related to 189 Young Adults in Metropolitan Lima during 2021.

| OHIP – Sp5 | Mean (SD) | Median (IQR) | Min. / Max. (range) | Percentage of participants who “never” reported an impact | Percentage of participants who “often” reported an impact |
|---------------------------------|--------------------|----------------|---------------------|---|---|
| Oral function | | | | | |
| Biting difficulties | 0.95 (0.69) | 1 (1–0) | 0–2 | 49 (25.93) | 0 (0.0) |
| Decreased taste | 0.25 (0.57) | 0 (0–0) | 0–3 | 152 (80.42) | 2 (3.70) |
| Orofacial pain | | | | | |
| Painful discomfort | 0.62 (0.79) | 0 (1–0) | 0–3 | 102 (53.97) | 5 (2.65) |
| Orofacial appearance | | | | | |
| Oral appearance discomfort | 1.07 (1.00) | 1 (2–1) | 0–4 | 66 (34.92) | 7 (7.41) |
| Psychosocial impact | | | | | |
| Difficulties doing regular jobs | 0.24 (0.54) | 0 (0–0) | 0–3 | 152 (80.42) | 8 (4.23) |
| OHIP Sp5 Total | 3.14 (2.38) | 3 (5–1) | 0–11 | Not applicable | Not applicable |

SD: Standard Deviation. **IQR:** Interquartile range.

In the oral function dimension, the questions “difficulty biting” and “reduced taste in food” obtained mean scores of 0.95 (0.69) and 0.25 (0.57), respectively. Regarding orofacial pain, 2.65% of participants frequently reported “painful discomfort.”

Additionally, in terms of orofacial appearance discomfort, a mean score of 1.07 (1.00) was observed and 7.41% of young people presented this discomfort “often.” Finally, the median total OHIP-Sp5 score was 3, with a minimum value of 0 and a maximum of 11.

Table 3 shows the different sociodemographic variables, habits, and consumption of e-cigarettes according to OHRQOL. In sex

variable, it was determined that female participants had lower OHRQOL 3.26 (2.35) compared to the men 3.06 (2.42). It was also determined that South Lima is where there was a higher 3.05 (2.43), with East Lima being the area with the lowest OHRQOL score, with no statistically significant difference.

Regarding the use of mouthwash, it was found that individuals who do not use it have a lower OHRQOL 3.57 (2.43) than those who use it. Regarding the variables of electronic cigarette use and frequency, both individuals who used these devices and individuals who reported doing so every day had a lower OHRQOL score with 3.17 (2.26) and 4.15 (3.18), respectively.

Table 3. General Characteristics, Habits, and E-Cigarette Consumption. According to the OHIP Sp-5 in 189 Young Adults in Metropolitan Lima During 2021.

| Variable | OHIP-Sp5 | | | |
|-----------------------------------|-----------------------------|--------------|-----------------------|------------|
| | Median (IQR)** | Mean (SD) | p-value | |
| Age | -0.04 θ | | 0.54 φ | |
| Sex | Female | 3 (1-5) | 3.26 (2.35) | 0.44 u |
| | Male | 2 (1-5) | 3.06 (2.42) | |
| Residence | South Lima | 3 (1-5) | 3.05 (2.43) | 0.88 π |
| | Central Lima | 3 (1-4) | 3.07 (2.36) | |
| | North Lima | 3 (2-5) | 3.28 (1.68) | |
| | East Lima | 2 (2-6) | 4.09 (3.41) | |
| Education | Secondary | 2 (1-6) | 2.89 (2.55) | 0.88 π |
| | Non-university higher | 2 (1-5) | 3.53 (3.13) | |
| | University higher | 3 (1-5) | 3.16 (2.22) | |
| | Graduate | 2 (0-3) | 2.22 (1.98) | |
| Monthly family income | Level E: <1,300 soles | 4 (2-5) | 3.82 (2.84) | 0.35 π |
| | Level D: 1,301-3,970 soles | 2 (2-5) | 3 (2.25) | |
| | Level C: 3,971-7,020 soles | 3 (1-6) | 3.59 (2.75) | |
| | Level B: 7,021-12,660 soles | 3 (1-4) | 2.89 (2.33) | |
| | Level A: \geq 12,661 | 2.5 (1-4) | 2.62 (1.71) | |
| Occupation | Employer | 1 (0-2) | 1.44 (1.42) | 0.10 π |
| | Self-employed | 2 (1-5) | 3.07 (2.43) | |
| | Employee | 3 (2-5) | 3.47 (2.29) | |
| | Worker | 5 (5-5) | 5 (-) | |
| | Unpaid family worker | 6 (6-6) | 6 (-) | |
| | Other | 3 (1-4) | 3.16 (-) | |
| ORAL HEALTH HABITS | | | | |
| Use of mouthwash | Yes | 2.5 (1-4) | 2.92 (2.34) | 0.05 u |
| | No | 3 (2-5) | 3.57 (2.43) | |
| Frequency of daily tooth brushing | 0 to once a day | 3 (1-6.5) | 4.08 (4.01) | 0.74 u |
| | 2 or more times a day | 3 (1-5) | 3.07 (2.24) | |
| Flossing | Yes | 3 (1-5) | 3.16 (2.36) | 0.73 u |
| | No | 3 (1-4) | 3.10 (2.44) | |
| E-CIGARETTE CONSUMPTION | | | | |
| Use | Yes | 3 (2-5) | 3.17 (2.26) | 0.70 u |
| | No | 3 (1-5) | 3.12 (2.47) | |
| Frequency | Never | 3 (1-4) | 2.98 (2.30) | 0.52 π |
| | Ex-smoker | 3 (2-4) | 3.41 (2.80) | |
| | Some days | 2.5 (1-5) | 3 (2) | |
| | Every day | 3 (2-8) | 4.15 (3.18) | |

u : Performed using the Mann-Whitney U test. π : Performed using the Kruskal-Wallis test. φ : Performed using Spearman's correlation test. θ : Correlation coefficient.

DISCUSSION

Approximately 12.5% of the Peruvian population uses e-cigarettes, with men being the highest consumers.⁹ Based on these premises, we seek to establish a connection between OHRQOL and the use of e-cigarettes among the youth of Metropolitan Lima during the year 2021. This study is aimed at determining the relationship between OHRQOL and the consumption of e-cigarettes among the youth of Metropolitan Lima during 2021.

There are different tools available to assess OHRQOL—including the OHIP-14 or OHIP-49 questionnaires.²⁰ These instruments evaluate the OHRQOL and are considered accurate, valid, and reliable tools in the Spanish language. However, in a study conducted by Rivera-Ramos *et al.*,²¹ comparing the applications of the different types of OHIP (14, 49, and 5) in patients with prostheses, it was observed that OHIP-49 was very extensive, which posed a disadvantage because the sample was made up of elderly people.

It was also observed that, at the time of applying the instrument, OHIP-14 was one-dimensional, and it was not possible to collect all the information for the study. OHIP-Sp5 is the most precise, short, and most recent instrument that measures OHRQOL because it has been used since 2020. Thus, the OHIP-Sp5 questionnaire by Simancas-Pallares *et al.*,⁵ allows for measuring OHRQOL in a brief way (5 questions) and offers more options for people in the

Spanish-speaking population to carry out the survey conscientiously and in a psychometrically solid way.

In the present study, the oral health habits of young people were examined, revealing that the majority have good oral health habits. All respondents brushed their teeth and used toothpaste, and 62% reported flossing.

This was consistent with the findings of a study in the Portuguese population in 2017,²² which reported that 100% of young people brushed their teeth every day and most used dental floss, reporting good oral health habits.

This could be explained by the fact that most of the young people surveyed in both studies had a stable socioeconomic level, which is related to the investigation by He *et al.*,²³ in 2017. They reported that people with a high socioeconomic level mostly present better oral health; they have greater purchasing power to buy oral hygiene instruments, as well as a culture of prevention in general health.²⁴

Regarding frequency of consumption of e-cigarettes, 29% of respondents reported using this device “some days,” while 10% reported using it every day. This is consistent with the findings of a study conducted in Canada,²⁵ where an increase in the consumption of e-cigarettes by young people was also observed.

This may be due to the popularization of these devices and, in turn, the opening of new stores where products are offered that have been sponsored as a healthier way to quit smoking.

Regarding the results of OHRQOL, a total mean of 3.14 (2.38) was obtained. This differs from the results of a study conducted in China²³ where a higher total mean was found.

This variation could be attributed to differences in oral habits, since only a small percentage reported using dental floss and mouthwashes in said study, which is why the OHIP score was higher.

Furthermore, in the oral function dimension, the variable “difficulty biting” had a mean score of 0.95 (0.69) compared with the previously mentioned study, which presents a mean value of 2.49 (0.87). This can be explained by the fact that participants had a mean age of 37 years in the aforementioned study, so the need for using dental prostheses increases with increasing age and there are greater difficulties in biting.²⁶ Similarly, another study conducted in Australia reported that OHRQOL decreases with age.²⁷

In terms of discomfort with oral appearance, 7.41% of study participants reported an impact “often,” which would suggest that they are not satisfied with their oral appearance. A systematic review by Larsson *et al.*,²⁶ mentioned that there is a moderate impact for the dimension of facial appearance in the CVRSO.

This difference can be explained by the fact that appearance or aesthetics are subjective perceptions, and they vary in each per-

son depending on their culture, expectations, standards, and importance.

When comparing OHRQOL according to socio-demographic characteristics in the study, no statistically significant differences were found. However, another study performed in Brazil reported the presence of differences depending on the sex of respondents. This is because women, being more subjected to stress added to the different hormonal changes, acquire harmful habits such as the consumption of tobacco or e-cigarettes, and do so more frequently.

Furthermore, a significant difference related to socioeconomic level was found in the abovementioned study, since the highest OHIP score was seen in families of low socioeconomic level.²⁸ In addition, in a previously mentioned study in China,²³ a statistically significant difference was observed regarding age since the OHIP 14 questionnaire had a mean of 5.5 (0.19) for young people aged 18 to 39 and 7.1 (0.26) for adults aged 40–59 years. Therefore, the perceived OHRQOL lowers with age. Control of bacterial plaque (mechanical and chemical), accompanied by the use of topical fluorides, is established as the basis for maintaining good oral health.²⁹

CONCLUSION

The results of the present study establish the importance of recording e-cigarettes use and frequency in medical history of the patients, as well as the need to implement educational strategies by health professionals to lower the consumption of e-cigarettes and thus avoid harmful effects on general health.

Furthermore, we recommend carrying out studies that evaluate the impact on oral health with the prolonged use of e-cigarettes and that record previous diagnoses of depression and anxiety. Regardless of the mentioned good oral hygiene practices, young persons who were e-cigarette users reported lower OHRQOL.

CONFLICT OF INTERESTS

The authors declare that they have no conflicts of interest.

ETHICS APPROVAL

Approval for this study was obtained from the Ethics Committee of the Department of Health Sciences of the Peruvian University of Applied Sciences (PI 440-20).

FUNDING

UPC-EXPOST-2023 incentive from the Peruvian University of Applied Sciences Research Directorate.

AUTHORS' CONTRIBUTIONS

Vargas-Claudio F: Investigation, data curation, formal analysis and writing original draft.

Castilla-Minaya O: Writing original draft; review and editing.

Leon-Rios XA: Investigation, methodology and project administration

ACKNOWLEDGEMENTS

We would like to thank the Peruvian University of Applied Sciences Research Directorate for the support provided to conduct this investigation through the UPC-EXPOST-2023 incentive.

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This manuscript was evaluated by the editors of the journal and reviewed by at least two peers in a double-blind process.

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ISSN Print 0719-2460 - ISSN Online 0719-2479.

<https://www.joralres.com/index.php/JOralRes/issue/archive>

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