Assessment of the need for orthodontic treatment in a Peruvian sample using the Dental Aesthetic Index.

Necesidad de tratamiento ortodóntico en una muestra peruana mediante el Índice Estético Dental.

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Abstract: **Introduction:** The Dental Aesthetic Index (DAI) is considered an essential tool in the association of the aesthetic and clinical elements of occlusion. It plays a key role in the timely and essential orthodontic treatment. **Objective:** to determine the orthodontic treatment required in students of a Peruvian public institution using the DAI. **Material and Methods:** A descriptive, observational, cross-sectional study was carried out during the months of June to July 2016 in a Peruvian educational institution. The sample consisted of 120 students. The use of the DAI allowed to assess the orthodontic treatment required, through the 10 occlusal conditions and regression indicators that constitute a linear formula, with the following components: no treatment required, elective treatment, desirable treatment, and priority treatment, according to the severity of the malocclusion as normal, defined, severe, and very severe, respectively. **Results:** 53.3% (64) of the students required priority orthodontic treatment due to presenting DAI=43.03. Between the ages of 12-14 years, 56.7% (34), 8.3% (5), and 28.3% (17) required priority, desirable, and elective orthodontic treatment, respectively. The need for priority orthodontic treatment was more prevalent in females accounting for 57.6% (38). 95% (57) of the students from rural areas required orthodontic treatment. **Conclusion:** The need for orthodontic treatment in a Peruvian sample using the Dental Aesthetic Index was priority orthodontic treatment, mostly in females with ages ranging between 12-14 years.

Keywords: orthodontics, corrective; orthodontics, interceptive; esthetics, dental; index; malocclusion; students.

Resumen: **Introducción:** El Índice Estético Dental (DAI) es considerada una herramienta indispensable en la aso-ciación de los elementos estéticos y clínicos de la oclusión, influyendo directamente en el tratamiento de ortodoncia oportuno y requerido. Objetivo: determinar el tratamiento de ortodoncia requerido en estudiantes de una institución pública peruana haciendo uso del

DAI. **Material y Métodos:** Estudio de diseño descriptivo, observacional, con corte transversal, ejecutado durante los meses junio a julio de 2016, en una institución educativa peruana. La muestra fueron 120 estudiantes. La observación mediante el uso del instrumento DAI permitió valorar el tratamiento de ortodoncia requerido, mediante las 10 condiciones oclusales e indicadores de regresión que constituyen una fórmula lineal, con categorías de: No requiere tratamiento, tratamiento electivo, tratamiento deseable, tratamiento prioritario, de acuerdo a la severidad de la maloclusión presente como oclusión normal, definida, severa y muy severa, respectivamente. **Resultados:** Estudio de diseño descriptivo, observacional, con corte transversal, ejecutado durante los meses junio a julio de 2016, en una institución educativa peruana. La

muestra fueron 120 estudiantes. La observación mediante el uso del instrumento DAI permitió valorar el tratamiento de ortodoncia requerido, mediante las 10 condiciones oclusales e indicadores de regresión que constituyen una fórmula lineal, con categorías de: No requiere tratamiento, tratamiento electivo, tratamiento deseable, tratamiento prioritario, de acuerdo a la severidad de la maloclusión presente como oclusión normal, definida, severa y muy severa, respectivamente. **Conclusion:** La necesidad de tratamiento ortodóntico en una muestra peruana mediante el Índice Estético Dental fue tratamiento de ortodoncia prioritario, predominando el género femenino entre los 12 -14 años.

Palabras Clave: *ortodoncia correctiva; ortodoncia interceptiva; estética dental; índice; maloclusión; estudiantes*

INTRODUCTION.

In the dental scientific community, various clinical indices are used to determine the requirement for orthodontic care, including the Dental Aesthetic Index (DAI).[1,2] The DAI classifies patients according to their need for orthodontic treatment, so they can be treated in the corresponding public health facilities.[3,4] Likewise, this index is used for epidemiological purposes or the implementation of effective healthcare programs.[4,5] The WHO places malocclusion in third place among oral conditions, with schoolchildren being the most vulnerable group, even experiencing psychological and systemic alterations.[6]

Public health records in Peru show that malocclusion has a high incidence, after carious lesions and periodontal diseases.[7] The WHO reports that Peru has 80% prevalence rate of malocclusion, affecting a large part of the population, especially adolescents.[8] This a public health concern as it has functional and/or aesthetic consequences that may affect the patient's psychosocial development and quality of life.[9]

In recent years, awareness about aesthetic care has been increasing, raising the demand for orthodontic treatment. Consequently, the interrelationship between oral and psychosocial health has increased considerably.[10]

Oral alterations that affect health, aesthetics, and personality of adolescents in the population under study have been observed.[10] However, few epidemiological studies on the prevalence and severity of malocclusion provide information, guidance and recommendations to adolescents and dentists for adequate and timely orthodontic treatment.[11,12]

Therefore, the aim of the present study was to determine the orthodontic treatment required in students of a Peruvian public institution using the Dental Aesthetic Index.

MATERIALS AND METHODS.

An observational, descriptive, cross-sectional study was conducted during the months of June to July 2016. The Graduate School of Universidad Señor de Sipán approved the research protocol with Dean Resolution No. 0040-2016/EPUSS-USS; in addition to the approval of the director of the educational institution. The participants agreed to be part of the study by signing an informed consent. The study consisted of a population of 600 students, with a sample of 120 participants obtained through a non-probabilistic

sampling for convenience. Inclusion criteria included: enrolled students from 12 to 17 years old who presented latemixed dentition or permanent dentition, assented to participate, had informed consent, and showed receptive behavior during data collection. Participants with a history of orthodontic treatment or under orthodontic treatment, and/or with a systemic disease were excluded from the study.

Data collection process

The Dental Aesthetic Index (DAI) was used.

It consisted of [10] components and regression coefficients: missing teeth (5.76), crowding in the incisal segments (1.16), spacing in the incisal segments (1.30), maxillary diastema in millimeters (3.13), highest irregularity on the maxilla (6.75), highest irregularity on the mandible (1.34), incisal overjet (1.62), reversed incisal overjet (3.68), anterior openbite (3.68), molar relation (3.69), with a constant value of 13.0.

A data collection form was used to register the data obtained through the dental clinical evaluation of each participant. The stomatological clinical evaluation was carried out by the main author, a specialist in Orthodontics and Maxillary Orthopedics, RNE No. 2233. To increase the reliability of the procedure, he went through a calibration process with 10 participants from the established sample, resulting in an intra-rater evaluation of Kappa Cohen 0.77 and inter-rater evaluation of Kappa Cohen 1.00, finding high agreement in both cases. A flat No. 04 mouth mirror with handle, without magnification, and a periodontal probe were used in a classroom with natural light illumination. The DAI was determined by a linear regression formula consisting of 10 occlusal conditions and their respective regression indices.

These are the steps of the collection process: first, the 10 components of each subject were measured, and their value was obtained. Second, the value was multiplied by the regression index. Third, the data found were added and the constant 13 was added. Fourth, the DAI was obtained.

And finally, the occlusal condition was categorized according to (DAI ≤25) in normal occlusion, not requiring orthodontic treatment; defined malocclusion (DAI 26 to 30) for elective orthodontic treatment; severe malocclusion (DAI 31 to 35), for desirable orthodontic treatment; and very severe malocclusion (DAI ≥36), which requires priority orthodontic treatment. Microsoft Excel and Office 2010, specifically Windows 7, were used for data processing, in addition to being analyzed by the chi square statistical test to determine the association of the variables, presenting them in Tables, finally pro-cessed in SPSS version 21.0.

RESULTS.

A total of 53.3% (64) of the participants obtained a DAI of 43.03, followed by 29.2% (35) who obtained a DAI of 32.85; only 7.5% (9) of the students obtained a DAI of 23.31 (Table 1).

In the group of students aged 12-14 years, 6.7% (n=4) had DAI ≤ 25, not requiring treatment [Normal Occlusion]; 8.3% (n=5) were between DAI 26-30, requiring elective treatment [Defined malocclusion]; 28.3% (n=17) between DAI 30-35, desirable orthodontic treatment [Severe malocclusion]; and 56.7% (n=34) had DAI≥36, requiring priority treatment [Very severe malocclusion]. On the other hand, in the group of 15-17 years old, 8.3% (n=5) had DAI ≤ 25; 11.7% (n=7) were between DAI 26-30; 30% (n=18) between DAI 30-35; and 50% (n=30) had DAI≥ 36, representing the conditions: No treatment required [Normal occlusion], elective treatment required [Defined malocclusion], desirable treatment required [Severe malocclusion], and requires priority treatment [Very severe malocclusion], respectively. For the association between the variables, the chi-square statistical test was used, from which a p-value=0.0868 was obtained, not finding a statistically significant relationship. (Table 2)

Of the female students, 6.1% (n=4) had DAI ≤ 25; 7.6% (n=5) between DAI 26–30; 28.8% (n=19) between DAI 30–35; and 57.6% (n=38) had DAI ≥ 36. Regarding male participants, 9.3% (n=5) had DAI≤ 25;13% (n=7) between DAI 26–30; 29.6% (n=16) between DAI 30–35 DAI; and 48.1% (n=26) had DAI ≥36. For the association between the variables, the chi-square statistical test was used, from which

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Table 1. Dental Aesthetic Index of students in a Peruvian Public Institution.

DAI scale	n	%	DAI
Under 25	9	7.5	23.31
26 – 30	12	10.0	28.25
31 – 35	35	29.2	32.85
Over 36	64	53.3	43.03
Total	120	100	37.11

Table 2. Required orthodontic treatment, according to the Dental Aesthetic Index and age.

Orthodontic treatment		Age group		Chi-square	
		12-14	15-17	test	Total
No treatment required	[Normal Occlusion]	4 (6.7 %)	5 (8.3%)	p-value=0.086	9 (7.5%)
Required elective treatment	[Defined Malocclusion]	5 (8.3 %)	7 (11,7%)		12 (10.0%)
Desirable treatment required	[Severe malocclusion]	17 (28.3 %)	18 (30%)		35 (29.2%)
Priority treatment required	[Very severe malocclusion]	34 (56.7%)	30 (50%)		64 (53.3%)
Total		60	60		120 (100%)

Table 3. Required orthodontic treatment, according to the Dental Aesthetic Index and gender.

Orthodontic treatment		Gender		Chi-square	
		Female	Male	test	Total
No treatment required	[Normal Occlusion]	4 (6.1%)	5 (9.3%)	p-value=0.062	9 (7.5%)
Required elective treatment	[Defined Malocclusion]	5 (7.6%)	7(13%)		12 (10.0%)
Desirable treatment required	[Severe malocclusion]	19(28.8%)	16 (29.6%)		35 (29.2%)
Priority treatment required	[Very severe malocclusion]	38 (57.6%)	26 (48.1%)		64 (53.3%)
Total		66	54		120 (100%)

Table 4. Required orthodontic treatment, according to the Dental Aesthetic Index and living area.

Orthodontic treatment		Place of origin		Chi-square	
		Urban	Rural	test	Total
No treatment required	[Normal Occlusion]	6 (10.0%)	3 (5.0%)	p-value=0.077	9 (7.5%)
Required elective treatment	[Defined Malocclusion]	6 (10.0%)	6 (10.0%)		12 (10.0%)
Desirable treatment required	[Severe malocclusion]	17 (28.3%)	18 (30.0%)		35 (29.2%)
Priority treatment required	[Very severe malocclusion]	31 (51.7%)	33 (55.0%)		64 (53.3%)
Total		60 (100 %)	60 (100 %)		120 (100%)

a *p*-value=0.0622 was obtained, revelaning a non-significant relationship statistically . (Table 3)

Finally, in urban students, 10% (n=6) had DAI ≤ 25; 10% (n=6) between DAI 26–30; 28.3% (n=17) between DAI 30–35; and 51.7% (n=31) had DAI ≥ 36. In those of rural origin, 5% (n=3) had DAI ≤ 25; 10% (n=6) between DAI 26–30; 30% (n=18) between DAI 30–35; and 55% (n=33) had DAI ≥ 36.

For the association between the variables, the chi-square statistical test was used, from which a *p*-value=0.0779 was obtained, not finding a statistically significant relationship. (Table 4)

DISCUSSION.

The type orthodontic treatment required by the participants in this study was priority orthodontic treatment in 53.3% of the cases, due to presenting a DAI of 43.03 (≥ 36). These results are similar to those obtained by Bellot-Arcis *et al.*,[13] in 2012, Ourens *et al.*,[14] in 2013, Claudino *et al.*,[15] in 2013, Navarro *et al.*,[16] in 2018, and Freitas *et al.*,[17] in 2015, being with respect to the component of malocclusion as a serious problem of social and aesthetic relevance.

Likewise, considering that the DAI obtained from the vast majority was 43.03 (64 of the participants) and only 7.5% obtained DAI 23.31 (the lowest), these are similar indicators to those reported by Gutierrez *et al.*,[9] in 2020 and Arellano *et al.*,[18] in 2016, with DAI values of 39.84 and 34.06 in their respective study samples.

In relation to the orthodontic treatment requirement according to age, it was observed that 95.0% (56) corresponded to ages between 12-14 years. The group of 15-17 years presented slightly lower values, 91.7%. These findings are similar to those reported by Kavaliauskienė *et al.*,[19]

Likewise, according to the evidence reported, It should be noted that the age range with the highest orthodontic treatment requirement corresponds to early adolescents,[20] in agreement with what we found in the present study, although not with statistical significance.

Regarding gender, it was found that the DAI was higher in females with 94.0% of which 57.6% needed priority treatment. In males, it was observed that 90.7% required orthodontic treatment, with 48.1% requiring priority treatment.

These indicators are different than those of Fernández *et al.*,[6] in 2015, who reported a higher prevalence in males 28.20% than in females 31.5%; even so it must be taken into account that orthodontic treatment requirements are higher in females than males.[21] In this study the differences are not significant.

On the other hand, from the point of view of the place of origin, 95% of the participants who required orthodontic treatment came from rural areas, surpassing those from urban areas. These indicators are similar to the Janošević *et al.*,[22] and Cai *et al.*,[23] which report high indicator levels of malocclusions in patients from areas with difficult access to healthcare services, in comparison to the urban populations that have greater accessibility to the healthcare systems.

Finally, determining orthodontic treatment according to the DAI in a young population is not only crucial in identifying malocclusion problems, since the literature already suggests it is a worldwide problem,[24-26] but it is important because it is related to other variables such as oral health, place of origin of the participants, and quality of life, which may guide in designing strategies to overcome this condition.[26-28]

CONCLUSION.

The students of a Peruvian public institution mainly required priority orthodontic treatment according to the results of the Dental Aesthetic Index, followed by desirable orthodontic treatment.

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