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The Psychosocial Impact on Gingival Aesthetics Questionnaire (PIGAQ): The Effect of Sociodemographic Variables on Results in a Spanish Adult Population. An Observational and Cross-Sectional Study

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ABSTRACT

Objectives: (1) Describe and categorize the scores obtained by the study sample for the PIGAQ as a whole and each of its subscales; (2) compare the psychosocial impact of self-perceived gingival aesthetics shown by the results for each subscale, determining which subscale shows the greatest impact, in relation to each of the following variables: gender, age, educational level, and involvement with the dentistry profession (non-professionals/professionals).

Methods: This observational and cross-sectional study is based on in-person interviews conducted by 10 trained operators, who administered the PIGAQ and collected data on gender, age, educational level, and connections to the dental profession in an adult (18–85 years) Spanish population. The data were collected over a 6-month period in 2024 in several regions of Spain. The main research outcome was the PIGAQ questionnaire (Likert scale) comprising 20 items in four subscales: gingival self-confidence (GSC), social impact (SI), psychological impact (PI), and aesthetic concern (AC), with a total score of 0–80 points. Data were analyzed using SPSS (v.28).

Results: In the sample, the subscale where self-perceived gingival aesthetics showed the highest negative impact was GSC, whereas the lowest negative impact was recorded for the SI subscale (with 36.5% and 1.0% of participants' scores representing a large negative impact, respectively). Significant psychosocial engagement with their gingival aesthetics was recorded for 5% of the study population (41–80). Total PIGAQ scores were significantly (p < 0.05) higher (a greater negative psychosocial impact) in participants who were male (21.23), aged 60 or over (23.83), not involved with the dental profession (19.90) and had only completed compulsory education (25.08). A significantly higher negative impact (p < 0.05) was recorded for participants aged 60 or over in the GSC (13.13), PI (4.88), and AC (2.96) subscales than for other age groups.

Conclusions: The negative psychosocial impact of self-perceived gingival aesthetics is low, with the highest impact recorded for the GSC subscale, and lower impacts experienced by participants who were female, aged under 26, had university-level education, and were involved with the dental profession.

Clinical Significance: Data are lacking on the psychological and social impacts suffered by patients who are dissatisfied with their gingival aesthetics, and how these impacts relate to sociodemographic variables. To date, no research has been published addressing

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this issue in the Spanish population. Only 5% of the population gained high scores on the PIGAQ, with most negative impacts related to self-confidence in their gingival aesthetics. The variable that most negatively affected PIGAQ scores was age, although this effect was limited. Particular attention should be paid to male patients over 60 years with compulsory-level education only, as this group has a greater tendency to present with psychosocial distress caused by a negative self-assessment of gingival aesthetics.

1 | Introduction

Defined as the perception of beauty in an appearance, aesthetics is a subjective concept. Such perceptions can be influenced by multiple factors, including gender, race, culture, profession, and education [1-5]. The aesthetic importance of the smile is evidenced by the recent increase in demand for treatments using prosthetic rehabilitations to modify dental appearance for purely cosmetic purposes, such as teeth whitening and crown lengthening [6-9].

Smile aesthetics are determined not only by the teeth (white aesthetics) but also by the gingiva (pink aesthetics) [4, 10–13]. The gingival architecture has a considerable influence on aesthetic outcomes, even in dental treatments, where factors such as papillary position influence the axial inclination of the teeth, or inflamed gingivae can frustrate efforts to perfect a smile [14]. Patient concern for gingival aesthetics has led to the integration of new techniques and materials into clinical practice, including composite resins and ceramics [15, 16], hyaluronic acid injections in the papillae [17, 18], Botox injections to reduce excessive gingival exposure [19, 20], and microsurgery to correct gingival recessions [21, 22]. The smile is also a valuable non-verbal means of expression and social interaction [23-25], affecting how observers perceive our personal and professional qualities [26-30]. It follows, then, that poor dental and gingival health or defects negatively impact self-esteem, quality of life, and other psychosocial factors [31-33].

Several validated questionnaires measure the impact of dental aesthetics, including the Dental Aesthetic Index (DAI) [34], Psychosocial Impact of Dental Aesthetics Questionnaire (PIDAQ) [35], Oral Health Impact Profile—aesthetic component [36], Social Appeal Index [27], Orofacial Aesthetic Scale [37] and Social Appeal Scale [26]. However, in-depth research on the psychosocial impacts of gingival aesthetics has yet to be completed. The only instrument addressing this issue is the recently validated Psychosocial Impact of Gingival Aesthetics Questionnaire (PIGAQ), with 20 items in four subscales: gingival self-confidence (GSC), social impact (SI), psychological impact (PI), and aesthetic concern (AC), the new questionnaire serving as the main outcome of this research [38].

Given this instrument's novelty, prior data is lacking on how gingival aesthetics impact psychosocial relations or the prevalence of gingival aesthetic disorders such as discoloration/melanosis, gingival contour changes, gingival recessions, excessive gingival display, and missing interdental papillae. More research is needed on gingival aesthetic conditions and their psychosocial impacts to help increase treatment rates, for which validated questionnaires are vital, given the difficulty of assessing individual perceptions and psychosocial factors. Quantifying the psychosocial impacts of gingival aesthetics in relation to sociodemographic variables can help dental professionals better understand patients' perceived aesthetic treatment needs, which do not always align with professional perceptions [39-41] or the diagnosis of buccal pathologies after intraoral examination [42]. Integrating into our practice the central role of psychosocial function in the FDI World Dental Federation's new definition of oral health [43] is vital to ensure professionals give due attention to apparently minor aesthetic disorders that can be of great psychosocial significance for patients. Psychosocial function describes an individual's ability to speak, smile, and interact in social and professional contexts without feeling discomfort or shame. Finding ways to help patients improve these capacities through studies on the psychosocial impacts of gingival aesthetics should be a central goal of dentistry research.

The objectives of this study are to: (1) describe and categorize the scores obtained by the study sample for the PIGAQ as a whole and each of its subscales, (2) compare the psychosocial impact of self-perceived gingival aesthetics shown by the results for each subscale, determining which subscale shows the greatest impact according to each of the following variables: gender, age, educational level, and involvement with the dentistry profession.

The null hypotheses are as follows: (1) self-perceived gingival aesthetics have no psychosocial impact on the Spanish population; (2) none of the variables considered has an effect on the overall questionnaire score or any of its subscale scores.

2 | Material and Methods

2.1 | Sample and Data Collection

The study participants included patients of the University Dental Clinic and the companions accompanying them, students and service/administrative staff from several university departments (law, speech therapy, translation, mathematics, pharmacy, and psychology), family members and acquaintances of the student interviewers, travelers in bus and train stations, shoppers in supermarkets, and customers in post offices. To meet the inclusion criteria, subjects were required to be 18-85 years old, of Spanish nationality, interested in participating in the study, and lacking cognitive and visual disorders. The final sample comprised 200 Spanish participants, including 123 women (61.5%) and 77 men (38.5%). Divided by age, 69 participants were aged 26 or under (34.5%), 107 were aged 27-59 (53.5%) and 24 were 60 or over (12.0%). Divided by educational level, 26 had only completed compulsory education (13.0%), 54 had completed further education (27.0%) and 120 had university-level education (60.0%). Finally, there were 166 (83.0%) non-professionals and 34 (17.0%) dental professionals (dentistry students, dental assistants, dental technicians, and dentists).

Ten volunteer dentistry undergraduate students (School of Dentistry, University of Salamanca) were trained to correctly collect the questionnaire data through in-person interviews, beginning with the standardized prompt "You will now be presented with statements about what you think about your gums and how that affects how you feel." The interviewers were not aware of the study's objectives. There was no time limit for responding to the questionnaire. While 204 questionnaires were completed, four were excluded as they lacked a response for more than two items. This sample size (to assess whether the PIGAQ could be validated) was justified by the matrix algebra, which showed 200 cases to be the minimum for obtaining reliable results in the factor analyses. The recommended ratio of 5-10 cases per item for scale validations was also considered, with the sample size of 204 producing a ratio of 8.87 people per item for the 23-item scale [44]. Thirty-five subjects responded to the PIGAQ a second time, up to 8 weeks after the first interview, for test-retest analysis. The research received approval from the institutional bioethics committee (USAL/CBE-Number 1102) and complies with the Declaration of Helsinki's principles. All questionnaire data were anonymized. The data were collected over a 6-month period in 2024, in 8 out of Spain's 17 autonomous communities (Madrid, Castile and León, Andalusia, Catalonia, Asturias, the Canary Islands, Galicia, and Valencia).

2.2 | The Questionnaire

(1) The first section collects data on age (in years), gender (man, woman), educational level (compulsory, further and universitylevel), and whether participants have any connection to the dentistry profession (professionals/non-professionals), and (2) the second section contains the Psychosocial Impact of Gingival Aesthetics Questionnaire (PIGAQ) [38], which was adapted from the Psychosocial Impact of Dental Aesthetics Questionnaire (PIDAQ). The general structure and scoring system of the PIDAQ are reflected in the PIGAQ, as follows. The questionnaire is divided into four subscales, including a total of 20 items (compared with the PIDAQ's 23), as shown in Table 1. Gingival Self-Confidence is the only subscale that provides statements expressing positive self-assessments of gingival aesthetics (GSQ, 6 items). The other three contain statements expressing negative perceptions of gingival aesthetics: social impact (SI), 7 items; psychological impact (PI), 4 items; and aesthetic concern (AC), 3 items. Responses are given using a five-point Likert scale: 0 (not at all) to 4 (very strongly) [38].

The overall PIGAQ score is calculated as follows. The scores for the GSQ subscale (the only positive domain) are inverted before the scores for all 20 items are transformed by subtracting 1 (i.e., 1 becomes 0, 2 becomes 1, etc.). This ensures that, for all items and subscales, a higher score indicates that self-perceived gingival aesthetics have a more negative psychosocial impact on the respondent. The subscale scores are then added together to give a total score of between 0 and 80. The overall score range was divided into two groups: between 0 and 40 indicating that selfperceived gingival aesthetics have a low psychosocial impact, and scores between 41 and 80 indicating a high impact. Scores for each subscale were similarly divided into "low impact" and "high impact" ranges, as shown in Table 2. **TABLE 1** | 20 Items in the Psychosocial Impact of GingivalAesthetics Questionnaire (PIGAQ) [38].

Psychosocial Impact of Gingival Aesthetics
Questionnaire (PIGAQ)—20 items

GSC	Gingival Self-Confidence (GSC)
GSC-1	I am proud of my gums.
GSC-2	I like to show my gums when I smile.
GSC-3	I am pleased when I see my gums in the mirror.
GSC-4	My gums are attractive to others.
GSC-5	I am satisfied with the appearance of my gums.
GSC-6	I find the position of my gums to be very nice.
SI	Social Impact (SI)
SI-1	If I do not know people well I am sometimes concerned what they might think about my gums.
SI-2	I am afraid other people could make offensive remarks about my gums.
SI-3	I am somewhat inhibited in social contacts because of my gums.
SI-4	I sometimes catch myself holding my hand in front of my mouth to hide my gums.
SI-5	Sometimes I think people are staring at my gums.
SI-6	Remarks about my gums irritate me even when they are meant jokingly.
SI-7	I sometimes worry about what members of the opposite sex think about my gums.
PI	Psychological Impact (PI)
PI-1	I envy the nice gums of other people.
PI-2	Sometimes I am somewhat unhappy about the appearance of my gums.
PI-3	I think most people I know have nicer gums than I do.
PI-4	I wish my gums looked better.
AC	Aesthetic Concern (AC)
AC-1	I do not like to see my gums in the mirror.
AC-2	I do not like to see my gums in photographs.
AC-3	I do not like to see my gums when I look at a video of myself.

2.3 | Statistical Analysis

Basic descriptive statistics (mean, median, minimum, maximum, standard deviation, and interquartile range) were obtained for the scores corresponding to each subscale, as well as the overall scores. To compare the overall scores, the unpaired *t*-test and one-way ANOVA were used (followed by Duncan's

multiple range test when there was statistical significance), while the Kruskal-Wallis and Mann-Whitney U tests were used to compare subscale scores. The significance level was set at 0.05.

TABLE 2 | PIGAQ subscales, number of items, maximum scores, and score categorization.

Subscale	No items	Maximum score	Categorization
Gingival Self- Confidence (GSC)	6	24	Low: 0–12 High: 13–24
Social Impact (SI)	7	28	Low: 0–14 High: 15–28
Psychological Impact (PI)	4	16	Low: 0–8 High: 9–16
Aesthetic Concern (AC)	3	12	Low: 0–6 High: 7–12
Total PIGAQ	20	80	Low impact: 0–40 High impact: 41–80





3 | Results

3.1 | Description and Categorization of the Scores for Each Subscale and the Overall PIGAQ Scores

The scores for the four subscales (GSC, SI, PI, and AC) are markedly right-skewed, although this is least pronounced for the GSC subscale (Figure 1). Most participants, therefore, obtained low scores for the SI, PI, and AC scales (meaning self-perceived gingival aesthetics had a low psychosocial impact) with only a few high scores, while most respondents gained scores for the GSC subscale that were neither high nor low. A normal distribution of scores was not identified for any subscale. Since the four subscales had distinct score ranges (Table 2), standardized scores were produced using percentages of the maximum possible score for each subscale (score $\times 100$ /maximum possible subscale score), which enabled the standardized scores to be compared across subscales (Table 3).

The overall PIGAQ scores (0-80) are also right skewed, although the Q-Q plot and histogram in Figure 2 show that the results approximate a normal distribution There are nine participants in the study sample (4.5%) with near-outlier overall scores, all of whom obtained higher scores than the other respondents (Figure 2).

The descriptive statistics for the subscale (original and standardized) and overall scores are shown in Table 3.



FIGURE 1 | Distributions of the scores of the four subscales of the PIGAQ questionnaire.

	Mean	Median	Min/max	SD	IR
Overall PIGAQ score	19.07	16.0	2/62	11.11	13.0
Subscales					
Original scores					
Gingival Self-Confidence (GSC)	11.52	11.0	0/24	5.14	6.0
Social Impact (SI)	2.19	0.0	0/19	3.78	3.0
Psychosocial Impact (PI)	3.20	2.0	0/15	3.26	5.0
Aesthetic Concern (AC)	2.16	1.0	0/12	2.62	4.0
Standardized scores					
Gingival Self-Confidence (GSC)	48.00	45.83	0/100	21.44	25.0
Social Impact (SI)	7.82	0.00	0/67.86	13.49	10.7
Psychosocial Impact (PI)	20.00	12.5	0/93.75	20.40	31.2
Aesthetic Concern (AC)	18.00	8.33	0/100	21.86	33.3

TABLE 3 | Basic descriptive statistics for the PIGAQ scores: Mean, median, minimum (min), maximum (max), standard deviation (SD), and interquartile range (IR).



FIGURE 2 | Q-Q plot and frequency histogram of the overall PIGAQ scores in the sample of participants.

This shows that no participants gained a total score between 62 and 80 points, meaning that a significant proportion of the possible score range is not covered by the sample (22.50%). The same occurred with the SI and PI subscales, where no respondents scored 19–28 points (32.14% of the possible score range) in the SI domain or 15–16 points (6.25% of the possible score range) in PI, as illustrated in Figure 3.

3.2 | Comparison of the PIGAQ Overall and Subscale Scores, in Relation to the Sociodemographic Variables Analyzed

Table 4 shows the observed contrast statistic values (t for the comparisons according to gender and connection to the dentistry profession; F for the comparisons according to age and educational level) and the P values associated with the overall questionnaire scores in relation to the variables.

The overall scores varied significantly between the distinct categories of the four factors analyzed and were higher (self-perceived gingival aesthetics had a greater impact) in participants who were male, aged 60 or over, not connected to the dental profession, and had only completed compulsory education. Table 5 shows the p values for the comparisons of scores for each PIGAQ subscale, according to each of the variables analyzed (Kruskal–Wallis and Mann–Whitney U tests).

Table 5 shows that: (1) Men scored significantly higher than women in the SI and PI subscales; (2) participants aged 60 and over scored significantly higher than others in GSC, PI, and AC; (3) respondents with compulsory education only scored higher than



FIGURE 3 | Percentage of participants characterized according to the degree of impact of gingival aesthetics in each subscale and in the overall PIGAQ score.

TABLE 4	L	Results of the comparisons of the overall PIGAQ score	res
according to) tł	ne variables analyzed.	

	Means (SD)	Statistic	р
By gender		-2.103	0.037
Women	17.72 (10.10)		
Men	21.23 (12.32)		
By age (years)		3.712	0.026
26 or under	16.87 (9.36)		
27–59	19.42 (11.87)		
60 or over	23.83 (11.00)		
By educational level attained		5.591	0.004
Compulsory	25.08 (13.18)		
Further	19.93 (11.32)		
University-level	17.38 (10.08)		
By connection to the dental profession		2.587	0.012
Non-professionals	19.90 (11.22)		
Professionals	15.03 (9.72)		

those with higher educational levels in SI and PI; (4) those with no connection to the dental profession scored higher than dental professionals in GSC. All the variables analyzed had an effect on at least one of the subscales. The variable that most affected selfperceived gingival aesthetics was age, which showed a negative impact in three of the four subscales: GSC, PI, and AC. Except in the SI subscale, the respondents who scored highest (indicating the greatest negative impact) were those aged 60 and over. Figures 4-7 show how the mean standardized scores varied according to each sociodemographic variable for the four subscales (GSC, SI, PI, and AC). The subscale where results showed the greatest negative impact was GSC, with no difference between the genders, and SI showed the lowest impact, where men scored significantly higher (p=0.009), as they did in PI (p=0.050) (Figure 4). For all three age groups, the greatest negative impact was recorded in GSC, followed by PI and AC, with participants aged 60 or over scoring significantly higher in these three subscales (p = 0.035, p = 0.014, and p = 0.049, respectively) (Figure 5). The greatest negative impact was observed in GSC, followed by PI and AC, for all three educational-level groups. Participants who had only completed compulsory education scored higher in all subscales, although these differences were only significant for the SI and PI subscales (p = 0.003 and p = 0.006, respectively) (Figure 6).

Non-professionals scored higher than dentistry professionals in all subscales, but these differences were only statistically significant for the subscale where the greatest negative impact was recorded: GSC (p=0.005) (Figure 7).

For all categories of the four variables analyzed, the subscale where results showed the greatest negative impact was GSC, and that with the lowest impact was SI. The main differences were observed between the PI and AC subscale results, as follows. A slightly greater impact was recorded for men in PI than in the AC subscale, while the impact recorded for women was about the same in both (Figure 4). A greater impact was recorded in PI than the AC subscale for all age groups, but the difference between subscale scores was greater for those aged 60 and over than for the other age groups (Figure 5). A greater impact was recorded in PI than the AC subscale for all three educational-level groups, but this difference between subscale scores was greater for those with compulsory education than for those with higher educational levels (Figure 6). For participants with no connection to dentistry, the impact

TABLE 5		Results of the	comparisons	of the	original	(non-sta	andardized)) scores for	each PIGAQ) subscale.
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	GSC		SI		PI		AC	
	Means	р	Means	р	Means	р	Means	р
Gender		0.296		0.009		0.050		0.358
Women	11.20		1.59		2.85		2.08	
Men	12.03		3.16		3.77		2.29	
Age (years)		0.035		0.796		0.014		0.049
26 or under	10.01		1.77		3.12		1.97	
27–59	12.13		2.31		2.88		2.10	
60 or over	13.13		2.88		4.88		2.96	
Educational level		0.166		0.003		0.006		0.211
Compulsory	12.96		4.08		5.35		2.69	
Further	12.20		2.52		2.98		2.22	
University-level	10.90		1.63		2.83		2.02	
Connection to the dental profession		0.005		0.179		0.261		0.051
Non-professionals	11.93		2.34		3.30		2.33	
Professionals	9.50		1.44		2.74		1.35	



FIGURE 4 | The mean plot of the standardized scores in the subscales of the PIGAQ questionnaire according to gender.

recorded was greater in PI than the AC subscale, while the impact was similar in the two subscales for dental professionals (Figure 7).

4 | Discussion

In the context of the growing concern for smile aesthetics demonstrated by increasing treatment rates [45], and the evidence supporting the positive effects of dental aesthetic treatment on self-esteem [46], the importance of instruments able to measure how patients perceive the appearance of their teeth, and the psychosocial impacts thereof, is well established [47]. The PIGAQ was developed to extend this capability to the gingival context [38], making this study the first to present findings on the extent to which negative self-perceptions of gingival aesthetics affect patients psychologically and socially.

The first null hypothesis of this study should be rejected since it has identified negative psychological and social impacts, albeit not excessively large and limited in prevalence, since only 5% of the sample obtained high overall scores in the PIGAQ, and no participants scored over 62 (out of a maximum of 80). Regarding the subscale scores, it should be noted that they do not contribute equally to the overall PIGAQ score, given the differing number of items, with SI having the most (7), followed by GSC (6). The GSC subscale had the highest mean standardized score (48.0%) and the highest number of respondents obtaining high scores (38.5%), indicating that respondents' dissatisfaction with their gingival aesthetics generates a lack of self-confidence that primarily concerns their self-image. A high psychosocial impact was recorded for a small proportion of respondents in PI and AC (7% for both subscales) and even fewer in the SI subscale (1%). In summary, the scores fell within the low to medium range for all subscales, indicating relatively minor psychosocial impacts corresponding to a low level of concern with gingival aesthetics. While direct comparisons cannot be made between the PIGAQ and the PIDAQ, given the distinct number of items, the lower visibility of the gingiva than the teeth in smiles may partly explain the generally higher scores obtained for the PIDAQ [38], as well as the greater weight of GSC compared with the other subscales in terms of psychological distress. "Self-confidence" describes people's acceptance and belief in their own attributes (selfimage). Concurrently, only one item in the GSC subscale refers to "others" whereas most PI and SI items focus on this perceived view of outsiders. It should be underlined that prior research is lacking on self-perceived gingival aesthetics or the psychosocial



FIGURE 5 | Mean plot of the standardized scores in the subscales of the PIGAQ questionnaire according to age group.



FIGURE 6 | Mean plot of the standardized scores in the subscales of the PIGAQ questionnaire according to educational level.

impacts of such perceptions and corrective gingival aesthetic treatments. However, the higher psychosocial impact recorded in the GSC subscale may be expected to affect individuals' interactions in the social and professional sphere, making intervention important. In the dental context, significant evidence does exist on the psychosocial benefits of treatment and its impacts on self-perceived aesthetics [48–52]. Similar improvements in patient satisfaction with aesthetics may be predicted after gingival treatment, resulting in lower PIGAQ scores, although this needs to be confirmed through further research.

The fact that all four sociodemographic variables examined (gender, age group, educational level, and connection to the dental profession) produced statistically significant differences in the scores for the PIGAQ as a whole and all four subscales is an important finding, meaning that the second null hypothesis should also be rejected. These findings cannot be directly compared with others since no other studies have yet used the PIGAQ in their methodology. Research has been conducted that has found occupation, gender, and age to have virtually no impact on self-perceived gingival aesthetics [53], although without analyzing the psychosocial impact of these perceptions. It is vital to conduct further research in distinct national populations due to the particularities of each country and the lack of similar studies for comparison that might reveal homogeneous or stable patterns in the results.

In the dental field, there is a lack of consensus over the role of age and gender in the psychosocial impact of aesthetics. Some studies point to women experiencing a greater psychosocial impact than men [54–57], while others disagree [58, 59], although it should be noted that most of this research is focused on young adults, while the present study covers adults in general in a gingival context. Men obtained significantly higher scores in the PIGAQ as a whole and the SI and PI subscales, indicating that self-perceived gingival aesthetics had a greater negative impact,



FIGURE 7 | Mean plot of the standardized scores in the subscales of the PIGAQ questionnaire according to involvement with the dentistry profession.

which could be related to the tendency for men to present with lower oral hygiene levels in the Spanish population [38]. It is well documented that controlling bacterial plaque through frequent tooth brushing is essential for preventing periodontal diseases such as gingivitis and periodontitis [60, 61] that result in undesirable aesthetic and functional changes. However, further research exploring this potential relationship is needed.

Some research has found no necessary association between age and dissatisfaction with dental aesthetics, despite the deterioration in dental appearance as age increases [62, 63], while other studies have found greater dissatisfaction with dental aesthetics in younger groups, finding older patients to be more accepting of negative dental aesthetics, and suggesting that such perceptions may be related to cognition more than cultural or behavioral variables [64, 65].

Age was the variable with the greatest effect on the present findings, with the 60 and over age group obtaining significantly higher scores in the GSC, PI, and AC subscales, indicating a greater negative psychosocial impact. Significant gingival and periodontal changes have been associated with age [66]. Several factors may contribute to such changes, including the influence of long-term medication on gingival health [38], epithelial thinning, reduced reparative capacity of the periodontal tissue (decrease in collagen), immunosenescence [67] reduced gingival circulatory function [68] chronic systemic diseases [69] and hormonal changes in women [38], all of which can negatively affect the cellular reparative response. Behavioral changes such as poorer hygiene levels may be another potential explanatory factor [38, 70–72] possibly related to the relative lack of education in oral hygiene received by more elderly participants during childhood, given the increased importance placed on this topic in recent years. Similarly, participants with a higher educational level can be presumed to have received more guidance and therefore have better assimilated basic oral hygiene practices [63]. The present results support this interpretation, with the group with the lowest educational level having obtained higher scores overall and in the SI and PI subscales.

One of the few studies to explore the aesthetic perception of gingival conditions among individuals with no background in dentistry stated that laypeople had particularly negative perceptions of disorders causing gingival asymmetry and color changes relating to missing papillae, gingival inflammation, and pigmentation, with changes in the contour and zenith of the gingiva perceived to have less aesthetic impact [14]. Other research has identified differences between the perceptions of professionals and non-professionals when assessing the gingival margins [73], with a study by Alomari et al. [74, 75] specifying that orthodontists, prosthodontists, and general dentists placed greater import on the lack of interdental gingival papillae, while periodontists and laypeople viewed gingival inflammation and pigmentation as most negatively affecting smile aesthetics. The present results showed that dental professionals scored significantly lower in the PIGAQ and the GSC subscale, possibly due to higher levels of dental care, training, and rapid resolution of perceived defects through treatment since such individuals generally respond more critically to aesthetic disorders related to the teeth [32] and gingiva [74].

5 | Limitations

There is an inherent risk of bias in clinical research such as the present study, the elevated prevalence of which is expected due to the use of variables that are affected by subjective factors related to participants (interest in the topic under study, motivation, personality-related factors, mood, etc.) and interviewers (method and place of contact with potential participants, fatigue, errors in data collection and/or processing, etc.), as well as the degree of precision and reliability of the new PIGAQ instrument and the study population, all of which are difficult to control. The present study's most significant limitation is its cross-sectional design, which can create temporal ambiguity, preventing causality from being attributed to any correlations. Additionally, the fact that the sample consisted primarily of isolated individuals limits our ability to generalize on the basis of the results. Bias may also have been introduced through the non-probabilistic sampling method (selection bias), as well as the use of interviewing for data collection, in which participants may give inaccurate data that is subject to bias.

It is important for future studies to correlate the findings on perceived gingival aesthetics and psychosocial impacts with professional intraoral examinations to quantify the gingival aesthetic defects present in participants (although noting the lack of specific indices for this purpose), such as asymmetries, black triangles, melanin deposits, gingival recessions, imbalanced gingival contours, and color changes resulting from gingivitis. Comparing such clinical observations with subjective perceptions may be particularly helpful when analyzing the differing PIGAQ scores of dental professionals and non-professionals. Recognizing such differences between professional and patient perceptions of aesthetics and treatment needs is important [42], enabling clinicians to identify patients whose need for treatment may stem more from the psychosocial impacts experienced than the "real" severity of the defect. It is therefore vital for dentists to understand their patients objectively (clinical characteristics and severity of gingival tissue disorders) and subjectively (aesthetic parameters considered acceptable, thresholds of perceptibility), as well as the psychosocial impacts experienced. Successfully analyzing and unifying all these concepts is essential to provide a comprehensive diagnosis that better describes the anatomical and psychosocial situation and results in greater satisfaction with treatment. The first necessary steps are securing effective clinician-patient communication in an atmosphere of trust and making use of the PIGAQ to collect targeted data on the psychosocial impact of gingival aesthetics. Health researchers' growing interested in psychological and social determinants in recent years reflects a significant shift in medical thinking, generating multiple lines of research in the public health field that draw on insights from the social sciences and psychology, meaning that the population's own perceptions about aesthetic disorders can no longer be considered a peripheral factor but should be central to aesthetic health research.

6 | Conclusions

Within the limitations of this study, it may be concluded that:

- 1. Self-perceived gingival aesthetics have minor negative psychosocial impacts on the Spanish population, primarily affecting participants' self-confidence about gingival aesthetics. Only 5% of the sample obtained high overall scores in the PIGAQ, and no participants scored over 62 (out of a maximum of 80).
- 2. There are statistically significant differences affecting all four PIGAQ subscales in the psychosocial impact of selfperceived gingival aesthetics between distinct groups, with the lowest impact experienced by women, participants aged under 26, people with university-level education, and those connected to the dental profession.

Conflicts of Interest

The authors declare no conflicts of interest.

Data Availability Statement

The data that support the findings of this study are available from the corresponding author upon reasonable request.

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