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General information

Journal of Face Aesthetics (JoFA) is the official journal published in Poland by the Poznan University of Medical Sciences in Poznań. Articles are published in English and Polish. The magazine is available both in digital form on the Internet (Open Access) and in paper version. The first issue of JoFA was published in 2018. The journal is focused on cooperation with scientists and specialists from various fields who want to contribute to the development of knowledge about facial aesthetics.

JoFA's goal is to promote multi-faceted research in all areas of facial aesthetics. Professional research is conducted not only in Poland, but throughout the European Union, as well as in other regions of the world, by experts from various medical, dental, humanities, cosmetology and other fields. Works submitted to the journal are reviewed by two independent reviewers, which ensures a high substantive and scientific level of articles published in JoFA.

The journal publishes original articles, systematic reviews, case studies, review articles and editorial letters, as well as memoirs on various topics. The journal's editorial staff ensures high quality of publications and focuses on promoting innovative and interdisciplinary research related to facial aesthetics.

The research concerns various populations in various cultural and geographical circles, many canons of beauty, so it is important that the research results are available and understandable to all interested parties. This allows us to better understand differences between populations and make health decisions more effectively.

Dissemination of research results can be done in various ways, such as scientific publications, scientific conferences, seminars, workshops or information campaigns. It is also important - and this is guaranteed by JoFA – to provide information in a way that is accessible to everyone, regardless of their level of education or social status. Thanks to the wide dissemination of research results, it is also possible to promote an attitude based on scientific evidence and build trust in science and expert knowledge.

We invite you to read JoFA and submit your articles for publication in our journal. We are sure that JoFA is a valuable source of information for everyone interested in facial aesthetics and we will be happy to share with you the latest scientific achievements in this field.

Ethical guidelines

The *Journal of Face Aesthetics* applies the ethical principles and procedures recommended by COPE (Committee on Conduct Ethics), contained in the Code of Conduct and Best Practice Guidelines for Journal Editors, Peer Reviewers and Authors available on the COPE website: https://publicationethics.org/resources/guidelines.

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Mariola Pawlaczyk

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Editor's note

Ladies and Gentlemen, Dear Readers,

in the second issue of the Journal of Face Aesthetics you will find interesting reports on the aesthetic appearance of the face and actions aimed at preserving it.

The correct selection of eyewear frames while maintaining the coherence of the face is discussed in the review paper. Based on current research in the field of optometry, ergonomics and functional design, the author emphasizes the role of a properly fitted frame, which not only allows for optimal positioning of corrective lenses, but also affects the comfort of using glasses, the user's well-being and is important for a consistent, aesthetic appearance of the face. It turns out that properly selected eyewear frames are important not only for adults but also for children because they may influence on both their visual and social development.

For those who perform apparatus treatments aimed at improving the appearance of the skin with signs of aging, we can recommend a review of the literature devoted to the mechanisms and effects of radiofrequency, ultrasound, laser therapy and carboxytherapy. Available studies indicate that the combination of apparatus therapies with proper diet and supplementation brings better aesthetic effects than the use of single methods.

For dentists, a review of the literature on the use of orthognathic surgery in the treatment of skeletal defects as the first method – the surgery-first approach – is worth recommending. This concept, which is an alternative to the classic orthodontic-surgical-orthodontic scheme, allows for an immediate improvement in the aesthetics of the facial profile, shorter time of complete treatment, and post-operative stability of the jaw. The use of sunscreen cosmetics that protect skin against sunlight is an important element of daily facial skin care. In patients with rosacea, they also complement the treatment. According to the research presented in the original paper, not all patients are aware of the adverse effect of sun exposure on the course of this dermatosis and educational activities are still needed.

In the current issue you will also find a description of surgical orbital decompression performed in a 37-year-old woman due to Graves' orbitopathy.

On behalf of the editorial committee, I would like to draw the readers' attention to the changes we have made to the editorial board. In the current issue, we publish papers in Polish and English, but from 2026 we will accept papers only in English. Authors cooperating with the journal are asked to read the new instructions on the journal's website. We look forward to active cooperation in the creation of subsequent issues of the Journal of Face Aesthetics.

We wish all readers pleasant reading of this edition and more in the 2026 year, a happy New Year and success in working on facial aesthetics!

Mariola Pawlaczyk
Editor-in-Chief

JoFA

ORIGINAL RESEARCH ARTICLE

Factors influencing the decision to initiate orthodontic treatment in patients seeking orthodontic consultation

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ABSTRACT

Introduction and aim. The decision to initiate orthodontic treatment is influenced by multiple factors beyond clinical need alone. Even patients with comparable malocclusion severity may differ in their willingness to undergo therapy. This study aimed to evaluate the association between selected demographic and occlusal characteristics and the decision to initiate orthodontic treatment in a retrospective clinical cohort.

Material and methods. A retrospective analysis was conducted using clinical records of 902 patients attending an initial orthodontic consultation between 2022 and 2024. Data collected during the first visit included gender, age, skeletal class, dental crowding, spacing, crossbite, scissor bite, and vertical overbite. Patients were categorized into three age groups. The outcome variable was treatment initiation, defined as the start of active orthodontic therapy. The proportion of patients initiating treatment was calculated for each subgroup and compared statistically.

Results. Age was significantly associated with treatment initiation ($p < 0.001$), with the highest uptake observed in younger patients (62.59%) and the lowest in older individuals (27.12%). Dental crowding was also significantly associated with treatment decisions (58.81% vs. 50.00%, $p = 0.038$).

No significant differences were found for gender, skeletal class, spacing, crossbite, scissor bite, or vertical overbite ($p > 0.05$).
Conclusions. Age and dental crowding were the only factors significantly associated with the decision to initiate orthodontic treatment. Other analysed occlusal characteristics did not demonstrate a significant relationship with treatment uptake. These findings suggest that treatment decisions are influenced selectively by factors that are more directly perceived by patients, rather than uniformly by all clinical features.

Keywords: orthodontic treatment, malocclusion, patient acceptance of health care, dental crowding, dental esthetics.

Introduction

Orthodontic treatment plays an important role in improving dental function, facial aesthetics, and patient-reported outcomes, including aspects of psychosocial well-being. Despite the potential benefits of treatment, the presence of malocclusion alone does not necessarily lead to treatment initiation, as even individuals with greater clinical treatment needs do not always proceed with therapy [1]. In routine clinical practice, some patients choose to undergo orthodontic treatment, whereas others – despite comparable clinical findings – do not.

The decision to undergo orthodontic treatment is a multifactorial process that reflects not only clinical characteristics but also individual perceptions, expectations, and practical considerations. Previous research has shown that treatment uptake is influenced by perceived aesthetic concerns, oral health–related quality of life, and contextual factors such as cost and treatment duration [2,3]. In addition, concerns related to discomfort, appliance visibility, and the anticipated burden of treatment may further affect patients' willingness to initiate therapy [4].

Most available studies have focused either on the prevalence and distribution of malocclusion traits or on comparisons between treated and untreated groups. In contrast, relatively few studies have examined treatment initiation as an outcome in relation to specific clinical characteristics in routine practice. However, less attention has been given to evaluating how frequently patients with defined clinical features decide to undergo treatment. Such an approach may provide a more clinically intuitive perspective, as it reflects the probability of treatment initiation within clearly defined subgroups encountered during initial consultation.

From a clinical standpoint, understanding which patient- and malocclusion-related factors are associated with the decision to initiate treatment may support more effective communication, improve expectation management, and facilitate decision-making during the first orthodontic visit.

Therefore, this study aimed to evaluate the association between selected demographic and occlusal factors and the decision to undergo orthodontic treatment in a retrospective clinical cohort.

Material and methods

Study design and setting

A retrospective study design was applied using routinely collected clinical data from an orthodontic practice (BlueMed Orthodontic and Medical Centre, Bydgoszcz, Poland). Records of patients attending an initial orthodontic consultation between 2022 and 2024 were reviewed. The analysis focused on information obtained during the first diagnostic visit.

Participants and eligibility criteria

The study population consisted of patients who attended their first orthodontic consultation within the study period and were at least 11 years of age at the time of assessment. Inclusion required the availability of complete diagnostic documentation necessary for the evaluated variables.

A total of 902 individuals met these criteria and were included in analyses involving demographic (gender, age) and skeletal variables. For occlusal characteristics (crowding, spacing, crossbite, and scissor bite), complete data were available for 840 patients, whereas vertical overbite assessment was based on 833 individuals with corresponding records.

For analytical purposes, participants were categorised into three age groups: younger (11–20 years), adults (21–40 years), and older individuals (41–60 years).

Outcome definition

The outcome of interest was orthodontic treatment uptake. Treatment initiation was identified from clinical records and defined as the start of active orthodontic therapy at the study centre, including placement of a fixed appliance or other documented therapeutic intervention.

Within each subgroup defined by the analysed variables, the proportion of patients who initiated treatment was calculated and expressed as a percentage.

Variables and study model measurements

The analysis included the following variables: gender (female/male), age category (younger, adult, older), skeletal class (class I, II, III), presence of dental crowding (yes/no), presence of spacing (yes/no), presence of crossbite (yes/no), presence of scissor bite (yes/no), and vertical overbite.

Vertical overbite categories were defined according to clinical measurements as follows: open bite (<0 mm), edge-to-edge bite (0 mm), normal overbite (1–2 mm), and deep bite (>2 mm).

All occlusal features were assessed from routinely collected clinical documentation obtained during the initial consultation and recorded as categorical variables for statistical analysis.

Study model analysis procedure

Clinical data were extracted from electronic records using a predefined data collection framework. Occlusal characteristics were evaluated according to standard clinical assessment protocols applied during the initial visit and subsequently entered into a structured dataset.

For each analysed factor, patients were grouped according to the presence or category of the given characteristic. The proportion of individuals who initiated orthodontic treatment was then calculated within each group, and differences between subgroups were analysed statistically.

Ethics and data protection

This study was based on a retrospective analysis of existing clinical data. A formal statement confirmed that the project did not constitute a medical experiment under applicable regulations (decision no. KB-775/25). All data were anonymised prior to analysis and handled in accordance with institutional data protection standards.

Results

Table 1 presents a comparison of the proportion of individuals who decided to undergo orthodontic treatment across different demographic and clinical subgroups. The n represents the total number of individuals in each subgroup, while % "yes" indicates the percentage of participants who chose orthodontic treatment.

Regarding gender, 53.78% of females (n = 608) and 55.44% of males (n = 294) opted for orthodontic treatment. The difference was not statistically significant (p = 0.639).

A significant association was observed for age (p < 0.001). The highest proportion of treatment decisions was found in the younger group (62.59%, n = 433), followed by adults (49.75%, n = 408), whereas the lowest

▼ Table 1. Comparison of the proportion of individuals who decided to undergo orthodontic treatment across different demographic and clinical subgroups

	n	% "yes"	p-value
Gender			
– female	608	53.78	0.639
– male	294	55.44	
Age			
– younger	433	62.59	<0.001*
– adult	408	49.75	
– older	59	27.12	
Skeletal class			
– class I	426	53.05	0.767
– class II	389	55.53	
– class III	87	55.17	
Crowding			
– yes	670	58.81	0.038*
– no	170	50.00	
Spacing			
– yes	182	53.85	0.328
– no	658	57.90	
Crossbite			
– yes	163	58.02	0.497
– no	677	56.87	
Scissor bite			
– yes	7	100.00	0.070
– no	833	56.66	
Vertical overbite			
– normal overbite	130	56.15	0.428
– open bite	78	51.28	
– deep bite	570	58.95	
– edge-to-edge bite	55	50.91	

* statistically significant difference.

percentage was observed in older individuals (27.12%, n = 59).

No statistically significant differences were found between skeletal classes (p = 0.767). The proportion of individuals choosing treatment was similar across class I (53.05%, n = 426), class II (55.53%, n = 389), and class III (55.17%, n = 87).

Dental crowding was significantly associated with the decision to undergo treatment (p = 0.038). Individuals with crowding (n = 670) were more likely to choose treatment (58.81%) than those without crowding (50.00%, n = 170).

For other occlusal characteristics, no statistically significant differences were observed. The presence of spacing showed similar treatment rates between those with spacing (53.85%, n = 182) and without spacing (57.90%, n = 658) (p = 0.328). Likewise, the presence of a crossbite did not significantly affect treatment decisions (58.02%, n = 163 vs. 56.87%, n = 677; p = 0.497).

All individuals with scissor bite (100%, n = 7) opted for treatment; however, the difference compared with those without this condition (56.66%, n = 833) did not reach statistical significance (p = 0.070), likely due to the very small sample size.

Finally, the decision to undergo treatment did not differ significantly across vertical overbite categories (p = 0.428). The percentages were 56.15% in individuals with normal overbite (n = 130), 51.28% in those with open bite (n = 78), 58.95% in those with deep bite (n = 570), and 50.91% in those with edge-to-edge bite (n = 55).

Overall, age and dental crowding were the only factors significantly associated with the decision to undergo orthodontic treatment.

Discussion

This study examined the association between selected demographic and occlusal characteristics and the decision to initiate orthodontic treatment in a retrospective clinical cohort. The results indicate that treatment uptake was not uniformly related to the analysed variables, suggesting that the decision to begin therapy is selective rather than directly determined by the presence of specific clinical features. Age emerged as the most influential factor associated with treatment initiation, while dental crowding showed a more moderate but statistically significant relationship. In contrast, most other occlusal characteristics did not significantly differentiate between individuals who initiated treatment and those who did not, indicating that not all clinically identifiable features contribute equally to decision-making in routine orthodontic practice.

The decision to initiate orthodontic treatment should be interpreted within a broader behavioural framework, in which clinical findings represent only one component of a multifactorial process. Available evidence indicates that patients' willingness to undergo orthodontic therapy is influenced by esthetic concerns and perceived treatment need, as well as by social and motivational factors [5]. In addition, preferences regarding orthodontic care are shaped by practical considerations related to the treatment process, including its duration, financial cost, and perceived benefits [6]. Treatment-related factors, such as the expected length and overall burden of therapy, may not only influence the decision to initiate treatment but also affect patient adherence and engagement throughout the course of therapy [7]. Within this context, treatment uptake can be understood as a selective process in which clinical characteristics contribute to decision-making primarily when the patient perceives them as relevant. A similarly multifactorial decision-making pattern has been reported in other areas of dentistry, where the choice between conservative and surgical treatment is influenced by both clinical findings and patient- and treatment-related factors [8].

Age was identified as the factor most strongly associated with the decision to initiate orthodontic treatment in the present study. The higher treatment uptake observed among younger individuals may reflect differences in the context in which treatment decisions are made, as both clinical recommendations and the social environment typically influence this age group. In addition, adolescence is a period in which dental appearance and facial aesthetics play a particularly important role in self-perception and peer interactions. Previous studies have demonstrated that dental appearance may significantly affect social judgments and interpersonal relationships in younger individuals [9]. That malocclusion can negatively impact quality of life and psychosocial well-being [10]. Furthermore, aesthetic concerns have been identified as a primary motivation for seeking orthodontic treatment, particularly among younger patients [11]. As a result, orthodontic treatment may be more readily perceived as necessary and desirable at a younger age.

In older age groups, differences in treatment uptake may be associated with variations in motivation and expectations regarding orthodontic treatment. Previous studies suggest that adult patients frequently seek treatment to improve dental appearance, although their motivations and psychological characteristics may differ from those of younger individuals [12]. Taken together, these findings indicate that clinical factors do not solely determine age-related differences in treatment uptake, but also reflect differences in how treatment need is perceived and prioritised across the lifespan.

Dental crowding was the only occlusal characteristic, apart from age, that showed a statistically significant association with the decision to initiate orthodontic treatment in the present study. The strong impact of anterior crowding on dental aesthetics and patient self-perception may explain this finding. Previous studies have demonstrated that anterior crowding is associated with increased self-consciousness and a negative impact on oral health-related quality of life, particularly in domains related to appearance and social interaction [13]. Individuals with more severe irregularities report poorer perceptions of their dental appearance [14]. Furthermore, dental aesthetics have been identified as one of the primary determinants of satisfaction with oral appearance and a key driver for seeking orthodontic treatment [15]. More recent evidence indicates that anterior crowding may negatively affect emotional and social well-being, particularly in younger individuals, reinforcing its relevance in treatment decision-making [16]. Given that crowding is a readily visible feature, it may be more easily recognised and prioritised by patients compared to other occlusal characteristics that are less apparent.

The absence of statistically significant associations for other occlusal characteristics may reflect differences in how patients perceive various malocclusion traits. Evidence suggests that the impact of malocclusion on oral health-related quality of life is not uniform and may vary by occlusal feature type [17]. In particular, traits that do not directly affect dental appearance may have a limited influence on patient perception and treatment-seeking behaviour.

Moreover, the relationship between clinically assessed malocclusion and patient-reported outcomes is complex and influenced by factors such as individual perception and contextual characteristics [18]. Therefore, the lack of statistically significant associations observed in the present study should not be interpreted as a lack of clinical importance, but rather as an indication that their role in treatment decision-making may be less directly perceived by patients.

The findings of the present study may have practical relevance for orthodontic consultations, particularly during the initial patient assessment. The results suggest that treatment decisions are more closely associated with factors directly perceived by patients, such as dental appearance, than with all clinically identifiable occlusal characteristics. This highlights the importance of considering patient perception and expectations during the diagnostic process.

From a clinical perspective, awareness of these factors may support more effective communication with patients, enabling clinicians to address individual concerns better and align clinical recommendations with patient expectations. In particular, recognising which features are more likely to influence treatment acceptance may facilitate a more patient-centred approach to treatment planning.

Several limitations of this study should be considered when interpreting the results. The retrospective design and reliance on routinely collected clinical data may limit the level of detail available for assessing occlusal characteristics. In particular, the analysis was based on selected clinical variables and did not include a more detailed diagnostic evaluation, such as a comprehensive cephalometric analysis or additional skeletal and dental measurements.

Furthermore, certain occlusal features were assessed in a simplified categorical manner, which may not fully reflect the complexity and severity of individual malocclusions. Future studies may benefit from incorporating more detailed diagnostic records, including quantitative measurements and extended cephalometric parameters, to provide a more precise understanding of how specific characteristics influence treatment decision-making.

Nevertheless, the present study provides a clinically relevant overview of factors associated with treatment initiation and may serve as a foundation for further, more detailed investigations in this field.

Conclusions

Within the limitations of this study, age and dental crowding were identified as factors associa-

ted with the decision to initiate orthodontic treatment. Other analysed occlusal characteristics, including skeletal pattern and selected occlusal relationships, did not demonstrate a significant association with treatment uptake.

These findings indicate that the influence of individual variables on treatment initiation is not uniform and that different factors may contribute to decision-making to varying degrees. In particular, some occlusal features may play a less prominent role in this process, despite their clinical relevance.

The results of the present study contribute to a better understanding of factors associated with orthodontic treatment initiation and provide a basis for further research incorporating more detailed diagnostic parameters and broader analytical approaches.

Declarations

Conflict of interest statement
The authors declares no conflict of interest.

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There are no sources of funding to declare.

Author contributions
Conceptualisation: AD, KN; Data curation: AD, KN; Formal analysis: KN; Investigation: AD, OK; Methodology: AD, KN; Visualisation: AD, KN; Writing - original draft: AD, FP; Writing - review & editing: MM, KN; Supervision: KN.

Data availability
Data will be made available by the corresponding author upon reasonable request.

Ethics approval and consent to participate
The study was conducted in accordance with the Declaration of Helsinki. The Bioethical Committee of the Poznan University of Medical Sciences approved this study and waived the requirement for informed consent due to the study's retrospective nature (Decision no. KB-775/25).

Declaration of generative AI and AI-assisted technologies in the manuscript preparation
Language-related support for this manuscript was provided using Grammarly and ChatGPT, an artificial intelligence-based conversational tool developed by OpenAI and powered by the GPT-5.2 language model. These tools were used solely for linguistic refinement, including grammar and stylistic consistency. No artificial intelligence tools were used to generate, modify, or interpret scientific content, data, or conclusions. The authors take full responsibility for the content of this paper.

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ORIGINAL RESEARCH ARTICLE

Hormonal disorders and acne severity in women aged 18–50: the role of PCOS and insulin resistance

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ABSTRACT

Introduction. Acne in young and adult women is a chronic hormonal-metabolic dermatosis that significantly impairs self-esteem and quality of life, owing to its predominantly facial distribution.
Aim. To assess the relationship between selected endocrine disorders – polycystic ovary syndrome (PCOS), insulin resistance, hyperandrogenism, and thyroid disease – and acne severity in women aged 18–50, and to evaluate patients' subjective skin assessments and the outcomes of hormonal treatment.
Material and methods. One hundred women aged 18–50 with self-reported skin problems completed an original online questionnaire covering sociodemographic data, diagnosed endocrine disorders, acne characteristics, skin hydration and sebum secretion, and the perceived effect of hormonal treatment. Statistical analysis was performed using the chi-square test ($p < 0.05$).
Results. Hormonal disorders were identified in 63% of participants, most commonly PCOS and insulin resistance (21% each). Acne was reported by 79% of women; moderate-to-severe disease predominated in those with hyperandrogenism (91.7%), PCOS (78.3%), and insulin resistance (72%; $\chi^2 = 133.84$; $p = 0.0019$). No significant association was found between hormonal disorders and skin hydration or sebum secretion. Women receiving hormonal treatment more frequently reported skin improvement than untreated women (50% vs. 27.4%; $\chi^2 = 14.64$; $p = 0.0055$).
Conclusions. Acne in adult women is strongly linked to endocrine disturbances – particularly PCOS and insulin resistance – underscoring the need for hormonal-metabolic work-up in patients with moderate-to-severe disease and for a holistic therapeutic approach that addresses both systemic causes and psychosocial burden.

Keywords: acne, adult women, hormonal disorders, insulin resistance, polycystic ovary syndrome.

Introduction

Acne in young and adult women is a chronic inflammatory disease of the pilosebaceous unit that may persist from adolescence or present de novo as early-onset adult or post-adolescent acne [1,2]. Lesions are predominantly facial, with a predilection for the lower face – the jawline, chin, and neck (the so-called U-zone) – so that even moderate severity substantially impairs self-esteem, quality of life, and social functioning [1,3]. Because acne frequently coexists with hormonal and metabolic disorders, it should be regarded not only as a cosmetic concern but also as a potential marker of underlying systemic abnormalities [4,5].

Chronic acne is associated with reduced self-esteem, shame, social withdrawal, and an elevated risk of anxiety and depressive symptoms; its psychosocial burden is comparable to that of other chronic somatic diseases, as confirmed by dermatology-specific quality-of--life instruments such as the DLQI [6,7]. A prospective Polish study further demonstrated that women with acne – despite milder clinical disease – report significantly worse quality of life, higher levels of stigmatisation, and greater anxiety than their male counterparts, highlighting the psychosocial vulnerability of this patient group [8]. In the context of hormonal disorders such as PCOS and insulin resistance, the presence of moderate-to-severe acne further aggravates body-image disturbance and the sense of chronic illness, reinforcing the need for a holistic, psychologically informed therapeutic approach. Understanding the pathomechanism of these changes requires an analysis of systemic factors, among which hormonal regulation plays a central role [9].

Steroid hormones – including androgens, oestrogens, and progesterone – regulate facial skin homeostasis through interactions with nuclear receptors: androgen receptors (AR), oestrogen receptors alpha and beta (ERα, ERβ), and progesterone receptors (PR), all of which are expressed in keratinocytes, fibroblasts, sebocytes, and hair-follicle cells. This hormonal balance is essential for maintaining the epidermal barrier; its dysregulation underlies a broad spectrum of dermatoses, ranging from acne to accelerated skin ageing [4,10].

Androgens – particularly dihydrotestosterone (DHT), converted from testosterone by 5α-reductase – potently stimulate sebogenesis, resulting in seborrhoea and impaired barrier function [11,12]. Excess androgen activity also promotes microbiome dysbiosis by creating a lipid-rich environment. Critically, current evidence revises the simple model of bacterial overgrowth in favour of a dysbiosis framework: the lipid-enriched milieu selectively promotes the pro-inflammatory phylotype IA1 of *Cutibacterium acnes* at the expense of commensal *Staphylococcus epidermidis*, triggering innate immune activation and biofilm formation that together underpin the pathomechanism of inflammatory lesions [13–15].

Oestrogens, acting through both genomic and non-genomic pathways, promote keratinocyte proliferation, collagen and hyaluronic acid synthesis, and lipid barrier reinforcement via ceramide production – a mechanism central to delaying skin ageing and preventing excessive dryness [16,17]. Progesterone, via the progesterone receptor, exerts anti-inflammatory effects and inhibits 5α-reductase activity, thereby attenuating DHT-mediated stimulation of sebaceous glands – a mechanism of particular relevance in states of androgen excess [10]. Stress hormones, including cortisol and corticotropin-releasing hormone (CRH), also modulate sebaceous gland function and inflammatory tone, although the direct impact of psychological stress on sebum production varies according to individual predisposition [18,19].

These hormonal interactions acquire particular clinical relevance in adult women, where chronic inflammatory dermatoses such as acne frequently co-occur with systemic endocrine disorders including PCOS and insulin resistance, creating a self-perpetuating cycle of inflammatory mechanisms [20,21].

Aim

The aim of this study was to assess the influence of hormonal disorders – particularly PCOS, insulin resistance, and hyperandrogenism – on the prevalence and severity of acne in adult women, and to analyse patients' subjective skin assessments and the perceived effects of hormonal treatment.

Material and methods

The study employed a diagnostic survey method among women with self-reported skin problems; participation was voluntary and

anonymous. The research instrument was an original online questionnaire comprising: socio-demographic data (age, BMI); medical history regarding diagnosed endocrine disorders (PCOS, insulin resistance, hyperandrogenism, thyroid disease); characterisation of skin lesions (acne severity, seborrhoea, hair growth abnormalities); and a subjective assessment of skin condition and skincare practices.

One hundred women aged 18–50 were included in the analysis, with a predominance of participants aged 18–25 (78%) and a mean BMI of 20.4 kg/m², within the normal body-weight range. Recruitment was conducted among patients of dermatological and cosmetological practices and among users of online thematic forums dedicated to skin problems.

Since the acne severity question permitted multiple responses, each participant was assigned to a single severity category based on the most severe response selected (severe > moderate > mild > no acne). Perimenstrual acne exacerbation was treated as a separate clinical variable and excluded from the severity classification, ensuring mutually exclusive categories for statistical analysis.

The collected data were analysed using Pearson's chi-square test (χ^2) with a significance level of $p < 0.05$.

Results

Characteristics of the study group

The study included 100 women aged 18–50, of whom 60% were students and 40% were employed. The dominant age group was 18–25 years (78%), while older groups (26–35, 36–45, and 46–50 years) accounted for 10%, 11%, and 1% of participants, respectively. The majority had a normal body weight (mean BMI 20.4 kg/m²), enabling analysis of hormonal influences on skin condition with limited confounding from BMI extremes.

Body weight changes and hormonal medications

More than one-third of participants (39%) reported weight gain over the previous two years, 15% reported weight loss, and 46% reported no significant change. The majority (84%) were not taking any hormonal medications other than contraceptives, while 16% used such preparations (including thyroid medications and metformin).

Diagnosed hormonal disorders and skin changes

Among participants, 37% had no diagnosed hormonal disorder, while a significant proportion had PCOS (21%), insulin resistance (21%), or hypothyroidism (18%). Additionally, 24% of participants were uncertain whether they had a hormonal disorder, suggesting a potentially underdiagnosed subgroup. The most commonly reported skin changes in women with hormonal disorders were: acne exacerbation (36%), changes in hair growth (23%), and excessive sebum secretion (17%) (see **Table 1**).

▼ Table 1. Skin changes in participants with hormonal disorders (multiple-response question)

Skin change	% of respondents*
Acne exacerbation	36.0
Changes in hair growth	23.0
Excessive sebum secretion	17.0
Excessive skin dryness	6.0
Hyperpigmentation	5.0
No changes / not applicable	56.0

* Percentage within the hormonal-disorder group; multiple responses permitted.

Subjective assessment of skin, hydration, and sebum

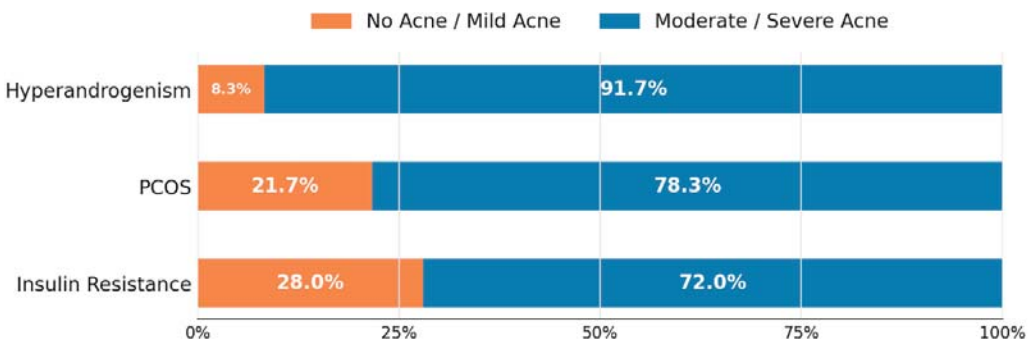
Most women rated their overall skin condition as average or good; fewer than one-fifth gave negative ratings (1–2 on a 1–5 scale). The distribution of responses regarding skin hydration and sebum secretion levels is presented in **Table 2**.

▼ Table 2. Subjective assessment of skin hydration and sebum secretion

Response	Skin hydration n (%)	Sebum secretion n (%)
Very low	5 (5.0)	14 (14.0)
Low	18 (18.0)	17 (17.0)
Average	67 (67.0)	51 (51.0)
High	9 (9.0)	17 (17.0)
Very high	1 (1.0)	1 (1.0)

Acne and its association with hormonal disorders

Acne was reported by 79% of participants; the most common forms were mild (38%) and moderate (30%), while severe acne was declared by 5% of women. Additionally, 26% of respondents observed acne exacerbation around men-



▲ Figure 1. Acne severity distribution across hormonal disorder subgroups.

struation, underscoring the role of hormonal fluctuations. Cross-tabulation analysis showed that moderate-to-severe acne was most prevalent in women with hyperandrogenism (91.7%), PCOS (78.3%), and insulin resistance (72%) (see **Figure 1**). The chi-square test ($\chi^2 = 133.84$; $p = 0.0019$) confirmed a statistically significant association between hormonal disorders and acne severity.

Perimenstrual acne exacerbation was excluded from severity classification. $\chi^2 = 133.84$; $p = 0.0019$.

Sebum, skin hydration, and hormonal disorders

Analysis of the relationship between diagnosed hormonal disorders and sebum secretion revealed no significant differences; average sebum levels predominated across most groups. The chi-square test ($\chi^2 = 70.75$; $p = 0.1614$) did not confirm a significant association between hormonal disorders and seborrhoea. Similarly, average hydration levels prevailed regardless of the type of hormonal disorder, and the chi-square test ($\chi^2 = 53.12$; $p = 0.7232$) did not demonstrate a significant relationship between hormonal disorders and skin hydration.

Hormonal contraception, hormonal treatment, and skin condition

Hormonal contraception was currently used by 40% of participants, 27% had used it in the past, and 33% had never used it. Among women using contraception, slight or marked improvement in skin condition was most frequently reported, although some noted no change and a minority experienced deterioration. Regarding other hormonal medications (not contraceptives), skin improvement (slight or significant) was declared by 50% of women taking such preparations, compared with 27.4% in the untreated group. The chi-square test ($\chi^2 = 14.64$; $p = 0.0055$) confirmed a statistically significant association between hormonal medication use and self-reported skin improvement.

Discussion

Recent literature emphasises that acne in young and adult women extends beyond an aesthetic concern, constituting a substantial burden on mental health, self-esteem, and quality of life [22]. Chronic inflammatory lesions in such a visible area as the face predispose to diminished sense of attractiveness, social isolation, and heightened anxiety and depressive symptoms, as demonstrated in studies using dermatology-specific quality-of-life tools (DLQI, CADI, HADS) [6]. In this context, the primary therapeutic goal extends beyond lesion reduction to minimising the psychosocial impact of the disease – a shift away from purely symptomatic treatment towards identification of its systemic causes [22].

The findings of the present study clearly confirm a close relationship between systemic disorders and skin condition. The highly significant correlation ($p = 0.0019$) between acne severity and insulin resistance (72% of severe cases) and PCOS (78.3%) aligns with the concept of metabolic dermatology and highlights the insulin–IGF-1 axis as a key driver of lipogenesis and hyperkeratinisation in adult acne. These data are consistent with the literature, in which insulin resistance and hyperinsulinaemia are recognised as important pathogenic factors in acne, particularly in women with PCOS [23].

Given the high proportion of participants with insulin resistance, the role of metformin warrants particular attention. Evidence indicates that this drug – at standard doses – not only reduces glycaemia but also lowers ovarian hyperandrogenism by improving tissue insulin

sensitivity, resulting in clinical improvement of acne in women with PCOS and insulin resistance. Its mechanism involves activation of AMPK kinase and secondary inhibition of the mTORC1 pathway, leading to reduced sebum production and attenuation of follicular inflammation [24].

For patients seeking an alternative to synthetic pharmacotherapy, berberine represents a promising option; its metformin-mimetic activity has been confirmed in recent studies. This alkaloid, administered at 3 × 500 mg, activates AMPK, reduces pro-inflammatory cytokines, and improves insulin sensitivity – effects that may translate into reduced inflammatory lesion severity in women with metabolic disorders and adult acne [25].

With respect to hormonal contraception, the present study found approximately 50% skin improvement in women using this form of therapy, consistent with current evidence in which hormonal contraceptives are recognised as a meaningful component of acne management in women. Combined oral contraceptives containing anti-androgenic progestogens – such as drospirenone and dienogest – show particularly favourable profiles; their mechanism involves androgen receptor blockade and inhibition of 5α-reductase activity. These preparations are recommended for acne with a hyperandrogenic aetiology, which also predominated among patients with the most severe disease in the present study [26–28]. Among other anti-androgenic agents, spironolactone has also demonstrated efficacy in adult female acne with a hyperandrogenic background, particularly in patients for whom combined oral contraceptives are contraindicated [26,29].

An intriguing finding was the absence of a statistically significant association between hormonal disorders and either skin hydration or sebum secretion – a result that may seem paradoxical given classical models of acne pathogenesis. This should be interpreted in light of current concepts that emphasise not so much the quantity of sebum as the alteration of its composition (lipid dysbiosis) and disruption of the epidermal barrier, which is frequently a consequence of aggressive skincare routines and inappropriate cosmetic procedures [13,30]. This underscores the need for concurrent skincare aimed at restoring the hydrolipid barrier – particularly in patients with severe acne and impaired quality of life [5].

Emerging evidence also implicates the gut–skin axis in the pathogenesis of hormonal acne in adult women [31]. Dysbiosis of the intestinal microbiome – increasingly documented in women with PCOS [32] – can impair oestrogen metabolism, amplify androgen activity, and sustain low-grade systemic inflammation, thereby promoting acneic lesions independently of cutaneous sebaceous gland activity. A 2025 study identified elevated serum trimethylamine N-oxide (TMAO) levels – a gut-derived metabolite – in acne vulgaris patients, suggesting a mechanistic link between dietary patterns, intestinal dysbiosis, and acne pathogenesis [33]. These findings are further supported by a recent review demonstrating that gut microbiome alterations in PCOS-associated acne reinforce the hyperandrogenism–insulin resistance cycle [34], pointing to probiotic supplementation and low-glycaemic dietary intervention as adjunctive strategies deserving further clinical investigation [32].

Several limitations of the present study should be acknowledged. The cross-sectional, self-reported design precludes causal inference, and acne severity was assessed subjectively rather than by validated clinical tools (e.g., IGA scale). The sample was predominantly young women aged 18–25, limiting generalisability to older adult cohorts. Furthermore, recruitment through online forums may have introduced selection bias towards women with greater health awareness or more severe skin concerns. Future studies employing clinical examination, biochemical hormonal profiling, and validated severity scales in larger, age-stratified samples are warranted to confirm and extend the present findings.

Taken together, the findings indicate that modern management of acne in adult women cannot be limited to topical interventions alone. Optimal care should encompass targeted endocrine and metabolic treatment – addressing PCOS, insulin resistance, and thyroid disorders – complemented by patient education regarding skincare and, where indicated, psychological support, with the long-term aim of mitigating the negative impact of the disease on self-esteem and quality of life.

List of abbreviations:

AMPK	AMP-activated protein kinase
AR	androgen receptor
BMI	body mass index
CADI	Cardiff Acne Disability Index

CRH	corticotropin-releasing hormone
DHT	dihydrotestosterone
DLQI	Dermatology Life Quality Index
ERα	oestrogen receptor alpha
ERβ	oestrogen receptor beta
HADS	Hospital Anxiety and Depression Scale
IGA	Investigator's Global Assessment
IGF-1	insulin-like growth factor 1
mTORC1	mechanistic target of rapamycin complex 1
PCOS	polycystic ovary syndrome
PR	progesterone receptor
TMAO	trimethylamine N-oxide

Declarations

Conflict of interest statement
The authors declares no conflict of interest.

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ORIGINAL RESEARCH ARTICLE

Author's professional system for organizing lash specialist work based on diagnostic protocols and load prediction

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ABSTRACT

This article presents the author's professional system for organizing the work of a lash specialist based on diagnostic protocols, growth phase analysis, and predictive load management. The proposed system does not focus on a specific extension technique, but rather on the structured decision-making process that ensures safe, clean, and predictable results in eyelash extension practice.
The article demonstrates how professional lash work can be transformed from an intuitive cosmetic procedure into a structured methodological system that includes natural lash diagnostics, growth phase differentiation, load prediction, directional control, and zonal architectural planning. A practical example from professional practice illustrates the effectiveness of this system in maintaining aesthetic quality while preserving the long-term integrity of natural lashes.

Keywords: lash diagnostics, predictive load, professional algorithm, lash architecture, decision-making system, applied cosmetology.

Introduction

In everyday professional practice, repeated observations reveal the long-term consequences of improper eyelash extension, including thinning of natural lashes, fragility, uneven density, premature shedding, disruption of growth direction, and weakening of the follicular structure. In most cases, these issues arise from ignoring lash growth phases and the absence of individualized load selection. These observations are consistent with existing literature on eyelash follicle biology, hair growth cycles, traction-related hair damage, and ocular complications associated with eyelash enhancement procedures. Previous studies emphasize that eyelashes have specific anatomical and physiological characteristics, including growth-phase differences

and limited tolerance to external mechanical stress. Therefore, professional eyelash extension should take into account follicular integrity, lash growth stage, structural compatibility, and potential risks associated with excessive traction or improper load distribution.

These practical observations became the foundation for developing the author's professional system, which transforms eyelash extension from an intuitive cosmetic procedure into a structured diagnostic and decision-making process aimed not only at aesthetic results, but primarily at the safe integration of artificial lashes into the natural lash line.

Aim of the study

The aim of this study is to present and systematize the author's professional system for organizing the work of a lash specialist based on diagnostic protocols, growth phase assessment, directional control, and predictive load management in everyday professional practice.

Material and methods

This study is based on an observational analysis of professional eyelash extension procedures performed using the author's predictive load management system.

The analysis included approximately 15–20 clients with varying natural lash conditions, including differences in density, thickness, and growth phase distribution.

Inclusion criteria: – clients with natural eyelashes suitable for extension procedures – absence of dermatological contraindications

Exclusion criteria: – severe lash damage – active eye infections or medical conditions affecting lash growth

All procedures were carried out under routine professional conditions with continuous observational assessment of structural behavior and load distribution.

Diagnostic protocol as the first stage of professional decision-making

The author's professional system begins with a mandatory diagnostic protocol that determines all subsequent technical decisions during the procedure.

Within the first 30–60 seconds of visual and tactile assessment, the lash specialist evaluates:

- total number of natural lashes,
- actual lash length,
- density and uniformity,
- pigmentation,
- presence of gaps,
- general condition of the lash line.

This rapid yet structured assessment allows the practitioner to shift from intuitive actions to a predictable, professionally guided strategy.

The diagnostic stage is not optional, but serves as the foundation for selecting thickness, length, curl, direction, and the overall architectural approach.

Growth phase analysis as a load-prediction tool

The life cycle of a natural eyelash consists of several phases, and understanding these biological processes is critically important for professional decision-making in eyelash extension.

Anagen is the active growth phase of a new lash. During this period, intensive cell division occurs in the follicular matrix. Lashes in the anagen phase are typically thin, short, weakly pigmented, and possess low load-bearing capacity.

Within the author's professional system, minimal thicknesses and shorter lengths are intentionally selected for anagen lashes, and in certain cases, such lashes are deliberately left without extensions.

Catagen is the transitional phase in which cell division slows down, the follicle gradually contracts, and the lash detaches from the dermal papilla. A significant portion of structurally mature lashes that form the main load-bearing mass of the lash line is present in this phase.

Telogen is the resting phase. Lash growth ceases and pigment production stops. The lash remains in the follicle until natural shedding occurs.

Exogen represents the stage of physiological shedding, during which the old lash leaves the follicle and a new one begins to develop.

Within this professional system, the condition of mature lashes (catagen and telogen) is used for objective assessment of the natural lash base and for predicting the permissible mechanical load during the procedure.

Working with anagen lashes as a critical decision point

One of the most common mistakes made by beginners is applying standard artificial lash lengths to short anagen lashes in an attempt to "align" the lash line visually.

A short anagen lash is actively growing. If a long or heavy artificial lash is attached to it, within one to two weeks it disrupts the lash line, creates an untidy appearance, causes sagging in certain eye zones, and leads to premature shedding.

Within the author's professional system, shorter and lighter artificial lashes are selected for anagen lashes, or the principle of conscious skipping is applied. This allows the natural lash, after further growth, to integrate organically into the overall architecture of the extension without disturbing structural balance.

This approach helps maintain an even lash line, prevent local overload, and predict a stable appearance of the extension throughout the wearing period.

Direction of lash placement as a functional element of the professional system

Correct lash placement direction has not only aesthetic but also functional significance. It directly influences:

- retention of the extension,
- stability of the result,
- architectural cleanliness,
- the possibility of visual eye-shape correction.

Within the author's professional system, the direction of each extension is selected according to:

- the natural growth direction of the lashes,
- eye placement and anatomical shape,
- the condition of natural lashes in each zone.

The use of different directions (straight, outward, upward, combined) allows the practitioner not only to create a visual effect, but also to correct drooping outer corners, asymmetry, and eye depth without overloading the natural lash structure.

Offset regulation as a safety and precision parameter in lash work

Within the author's professional system, the distance from the eyelid margin is considered one of the key control parameters that determines both safety and architectural cleanliness of the work.

The optimal professional offset averages 0.3–0.5 mm and may vary depending on eyelid sensitivity, tendency to swelling, and individual anatomical features.

Both insufficient and excessive distance create professional risks such as:

- eyelid irritation,
- reduced retention,
- disruption of architectural alignment,
- client discomfort.

This parameter is not incidental but is deliberately and consistently regulated throughout the entire procedure.

In championship-level works, offset distance is evaluated as an independent judging criterion and reflects the practitioner's level of professional training and precision.

Continuous load regulation during the procedure

A key component of the author's professional system is the ongoing regulation of mechanical load applied to each individual natural lash.

Indicators of excessive load may include:

- sagging in specific eye zones,
- premature shedding,
- distortion of lash direction,
- appearance of gaps in the lash line,
- client discomfort during the wearing period.

Throughout the procedure, the practitioner continuously reassesses whether the selected artificial lash matches the structural capacity of each natural lash. Load management is therefore not limited to the initial diagnostic stage but remains an active, dynamic process during the entire application.

Zonal planning as a component of lash architecture

In the author's professional system, the lash line is not treated as a uniform working field. It is divided into functional zones that require different technical decisions.

Inner corner

This area contains thin and vulnerable lashes. In many cases, several lashes are intentionally left without extensions to prevent overload.

Central zone

This zone often has the greatest potential for length and forms the main architectural axis of the extension design.

Outer corner

Frequently a previously overloaded or weakened area due to long-term volume extensions.

This zone requires corrective rather than intensifying work.

Such zonal differentiation allows the practitioner to construct the extension design based on anatomical and structural characteristics rather than a standardized decorative scheme.

Eye modeling as a component of the professional decision-making system

Within the author's professional system, eye modeling is not used as a decorative scheme but as a tool for gentle functional and visual correction based on anatomy and the condition of natural lashes.

Through the deliberate selection of lengths, curls, and placement directions, the practitioner is able to:

- visually widen or narrow eye placement,
- lift or soften the outer corners,
- balance natural asymmetry,
- enhance eye shape without overloading the natural lashes.

Modeling is therefore determined not by a predefined styling pattern but by diagnostic assessment of eye structure and lash growth characteristics in each zone.

Professional decision-making algorithm of the lash specialist

In professional eyelash extension practice, the quality and safety of the result depend not only on technical skills but primarily on the sequence of professional decisions made before and during the procedure.

The author's professional system is based on a consistent decision-making algorithm that allows the practitioner to adapt the technique to each individual client.

This algorithm includes the following stages:

- assessment of the natural lash condition,
- identification of growth phases across the lash line,
- determination of permissible load for each zone,
- selection of curl, thickness, and length according to structural compatibility,
- control of placement direction,
- regulation of offset distance from the eyelid margin,
- continuous monitoring of load balance throughout the procedure.

This structured sequence transforms eyelash extension from an intuitive cosmetic manipulation into a controlled professional system grounded in diagnostics, prediction, and architectural planning.

Practical case demonstrating the application of the professional decision-making algorithm

A representative case from a series of observed professional cases involved a client with a history of long-term heavy volume eyelash extensions.

The natural lashes were visibly thinned, uneven in density, and showed signs of structural weakening.

Before the procedure, a full diagnostic assessment was conducted in accordance with the author's decision-making algorithm. Growth phases were identified across different zones of the lash line, permissible load was determined for each area, and individual parameters for curl, thickness, length, direction, and offset distance were selected.

During the procedure, continuous monitoring of load balance and structural correspondence was maintained.

Over the following months of work using this algorithmic approach, the client demonstrated not only improved retention and architectural cleanliness of the extensions, but also a noticeable improvement in the condition of the natural lashes. Density became more uniform, breakage decreased, and the lash line regained structural stability.

This case demonstrates how a structured professional system of decision-making directly influences both aesthetic results and long-term biological safety. Clinical photographs are not included due to client confidentiality and privacy considerations.

Evaluation criteria

The effectiveness of the method was evaluated using qualitative assessment criteria, including:

- structural stability of the lash line,
- absence of visible overload (bending, twisting, collapse),
- retention consistency during the wearing period,
- preservation of natural lash condition,
- overall architectural cleanliness of the extension.

Results

The implementation of the author's professional system for organizing lash specialist work enabled precise control of mechanical load across all lash zones. The practitioner was able to consistently predict retention, maintain architectural cleanliness, and prevent common complications associated with improper extension techniques.

Natural lashes in different growth phases maintained structural stability, and no signs of overload, bending, twisting, or directional distortion were observed during the wearing period.

The system demonstrated predictable aesthetic outcomes together with long-term preservation of the natural lash base.

Discussion

In everyday lash practice, many procedures are performed intuitively and are guided primarily by the desired visual effect rather than by structural and biological compatibility with natural lashes. This often leads to unpredictable retention and gradual weakening of the lash line.

The professional system described in this article shifts the focus from decorative results to diagnostic assessment, load prediction, and controlled architectural construction. By applying a structured decision-making algorithm, eyelash extension becomes a regulated professional process rather than a subjective cosmetic service.

This approach allows practitioners to align aesthetic objectives with biological safety and significantly improve the quality, stability, and predictability of their work.This study is limited by the absence of quantitative statistical analysis and is based on applied professional observations within routine practice.

Conclusions

The author's professional system for organizing lash specialist work translates practical experience into a structured diagnostic and technical protocol. It ensures the safe integration of artificial lashes with the natural lash base, predictable aesthetic outcomes, and long-term preservation of lash health.

This system can serve as a practical methodological framework for lash professionals seeking to improve work quality through diagnostics, load control, and architectural precision.

Ethical considerations

The procedure described in this article is non-invasive and cosmetic in nature. The author's professional system prioritizes the principle of "do no harm" through individualized diagnostics, load control, and structural compatibility with natural lashes.

Declarations

Author Statement
The professional system described in this article is based on the author's long-term practical experience in eyelash extension and on repeated observational analysis in everyday work. All conclusions presented are derived from the consistent application of diagnostic protocols, growth phase assessment, load prediction, and architectural planning in professional practice.

Conflict of interest statement
The authors declares no conflict of interest.

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SYSTEMATIC REVIEW

Probiotics and chronic inflammatory skin diseases

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ABSTRACT

It is well established that probiotics exert beneficial effects on human health. Their use in prophylaxis and therapy, particularly in inflammatory diseases of the gastrointestinal tract, is undisputed. Moreover, studies from recent years indicate that the administration of probiotics in dentistry is advisable, particularly in dental caries and in chronic periodontitis in adults. In this study, the available data on the potential application of oral and topical probiotics, including their mechanisms of action, in dermatological therapy were analyzed. The present review focuses on the effects of oral and topical probiotics in chronic skin diseases, emphasizing their role in the management of atopic dermatitis, acne vulgaris, rosacea, and psoriasis.

Keywords: probiotics, atopic dermatitis, acne vulgaris, rosacea, psoriasis.

The skin of a healthy individual constitutes a barrier protecting the body against microbial invasion and infection. This protection is determined by the normal anatomy and physiology of the skin, as well as its colonization, primarily by nonpathogenic bacteria. These are resident microorganisms that normally grow on or within the skin, remaining more or less constant. Colonization of the skin by resident microorganisms represents physiological colonization, occurring at densities of approximately 10^4–10^5 bacteria/cm² [1]. Resident bacteria typically include aerobic genera such as *Staphylococcus* (including *S. epidermidis* and *S. hominis*), *Corynebacterium* (aerobic coryneforms), *Micrococcus*, and anaerobic species such as *Propionibacterium acnes* (formerly *Cutibacterium acnes*). The latter is ordinarily a harmless resident but may incite or contribute to the condition known as acne [2].

Other microorganisms, usually present only temporarily on the skin, are classified as transients and may include streptococci, enterococci, enterobacteria, pseudomonads, and others. Physiological colonization reduces the risk of

infections and skin diseases by preventing pathological colonization, which results from the adherence of pathogenic microorganisms to skin cells [3]. Moreover, some *Staphylococcus* species, particularly *Staphylococcus epidermidis* and *Staphylococcus hominis*, can produce commensal-derived antimicrobial peptides (AMPs), such as phenol-soluble modulins and lantibiotics. These peptides exert antimicrobial activity and act synergistically with host-derived AMPs, such as cathelicidin IL-37, to inhibit the survival of skin pathogens [4,5]. Thus, the physiologic (normal) microbiota of the skin, along with the AMPs produced by its constituent bacteria, provides the first line of defense against microbial pathogens. A reduction in the number of resident microorganisms on the skin often results from personal hygiene practices or treatment with antiseptics. However, the normal microbiota can be rapidly restored owing to the active growth of the remaining viable resident bacteria.

It is well established that probiotics can help maintain a healthy balance of the intestinal flora and stabilize the intestinal epithelial cell barrier. In line with the current WHO definition [6], probiotics are living microorganisms which, when consumed in adequate amounts, exert beneficial health effects independently of basic nutrition. Moreover, this definition is supplemented by specific criteria: a probiotic agent should neither be pathogenic nor toxic to the human body, and it should not induce immune disturbances. Thus, a probiotic strain should have GRAS (Generally Recognized As Safe) status, and the safety of its application should be supported by both *in vitro* and *in vivo* studies [7]. Probiotic strains include mainly lactic acid bacilli of the *Lactobacillus* and *Bifidobacterium* genera, as well as *Saccharomyces boulardii* yeasts. Oral administration of probiotics in prophylaxis and therapy, particularly for gastrointestinal diseases (including antibiotic-associated diarrhea), is no longer questioned [8,9].

Probiotics help maintain a healthy balance of intestinal flora, stabilize the mucosal barrier, and promote mucin secretion, thereby preventing colonization of pathogens within the epithelium. Pathogen inhibition is mediated through two distinct mechanisms [5,10,11]. The first is a component of the physical defense system, which directly prevents pathological colonization by limiting the available space for pathogens. It should be emphasized that some probiotics are capable of effectively colonizing the skin [12].

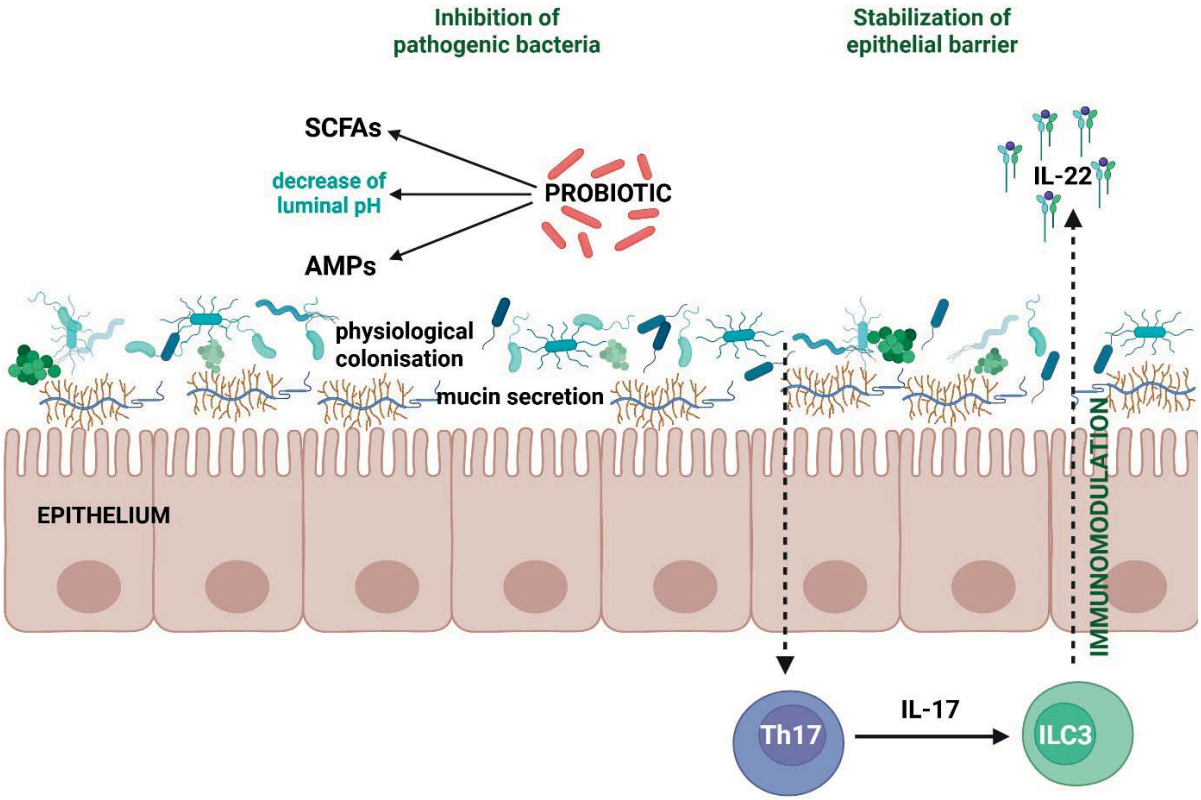
The second mechanism is associated with the antagonistic properties of probiotics, primarily resulting from the production of short-chain fatty acids (SCFAs) and lactic acid, as well as the synthesis of antimicrobial peptides (AMPs). These compounds may directly inhibit the growth of, or inactivate, pathogenic microorganisms [12].

The accumulation of high concentrations of SCFAs in the intestinal tract can rapidly decrease the pH, thereby inhibiting pathogen growth. Furthermore, certain probiotic strains have been shown to induce T helper 17 (Th17) cells, leading to the secretion of interleukin-17α (IL-17α), which subsequently stimulates type 3 innate lymphoid cells to produce interleukin-22 (IL-22). This cytokine plays an important role in maintaining intestinal homeostasis, promoting healing, and facilitating tissue regeneration. The effects of probiotics on the host are presented in **Figure 1**.

Moreover, in recent years, increasing evidence has pointed to the existence of a gut–skin axis, a relationship between intestinal microbiota and inflammatory skin diseases [13,14].

The antineoplastic activity of probiotic strains has also been analyzed [15]. *In vitro* studies have demonstrated that probiotics can induce tumor cell apoptosis and inhibit tumor cell proliferation and metastasis [16]. In a mouse cancer model, the use of a probiotic aerosol formulation with *Lactobacillus rhamnosus* GG was shown for the first time to play a beneficial role in preventing melanoma metastasis and in activating antitumor effector cells [17]. These findings suggest the potential of a novel strategy involving the administration of probiotics in spray form, which may be particularly useful in the treatment of skin diseases. Other studies in mouse models have reported that *Bifidobacterium bifidum* and *Lactobacillus acidophilus* can be used as biotherapeutic agents to inhibit colon cancer by modulating intestinal microbiota [18].

Recent research has also demonstrated that probiotics are useful as supplementary preparations in dentistry. Probiotics containing hydrogen-peroxide–producing *Lactobacillus* species may exert antagonistic effects against cariopathogens and periopathogens, thereby reducing the initiation of the cariogenic process and the progression of chronic periodontitis [19]. In my own research, I demonstrated that probiotic tablets containing the *Lactobacillus reuteri* strain significantly improved clinical parameters and reduced proinflammatory cytokine levels



▲ Figure 1. The effects of probiotics on the host (SCFAs – shot chain fatty acids, AMPs – antimicrobial peptides, Th17 – T helper cells 17, ILC3 – Type 3 innate lymphocyte) created with BioRender.com.

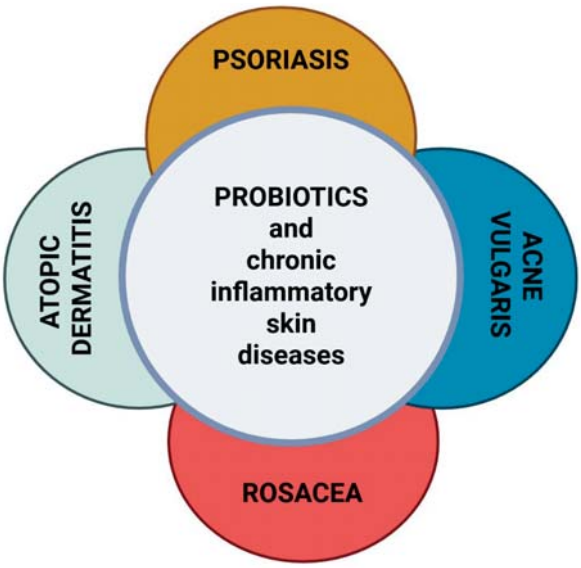
in patients with moderate chronic periodontitis [20]. The results of these and other studies justify the implementation of novel strategies for the use of probiotics in oral diseases [19].

In dermatology, oral and topical probiotics are used in the treatment of inflammatory skin diseases, as shown **Figure 2** [5,13].

The aim of this study was to analyze the beneficial effects of probiotics in skin diseases, including atopic dermatitis, acne vulgaris, rosacea, and psoriasis. Moreover, it was considered appropriate to present current concepts regarding the anti-inflammatory mechanisms of action of probiotics, particularly in inflammatory skin diseases.

Atopic dermatitis (AD) is a genetically determined chronic inflammatory skin disease associated with significant dysfunction of both the epidermal and intestinal barriers, induction of chronic skin inflammation, and alterations in microbiota composition [13,21]. *Staphylococcus aureus* is the most common pathogenic bacterium, dominating on the skin of AD patients, whereas *Staphylococcus epidermidis* and *Corynebacterium* spp. are markedly depleted. Numerous studies have demonstrated the beneficial effects of oral probiotics on the clinical symptoms of patients with AD. The oral probiotics used most frequently contain strains such as *Lactobacillus bulgaricus*, *Lactobacillus casei*, *Lactobacillus paracasei*, *Lactobacillus helveticus*, *Lactobacillus plantarum*, *Lactobacillus rhamnosus*, *Bifidobacterium bifidum*, and *Bifidobacterium adolescentis* [22,23].

Acne vulgaris (AV) is a chronic skin disease with periods of exacerbation, most commonly affecting young individuals. It is associated with hyperactivity of the sebaceous glands and is characterized by the formation of non-inflammatory comedones or inflammatory pustules, located primarily on the face and back, along with increased levels of proinflammatory cytokines in the skin [24]. A large volume of sebum accumulating within the sebaceous glands, together with the presence of *Cutibacterium acnes* in the pilosebaceous canal, may play a causal role



▲ Figure 2. Probiotics and chronic skin diseases.

in AV [24]. This anaerobic bacterium produces lipase enzymes that hydrolyze sebum triglycerides into free fatty acids. These compounds are particularly irritating, as they can penetrate into the dermis and promote inflammation. Moreover, recent studies suggest a role for insulin and insulin-like growth factor (IGF-1) in the pathogenesis of AV [25]. Their increased production, associated with a high-carbohydrate diet, may promote the proliferation of sebocytes and keratinocytes, as well as induce lipid synthesis in the sebaceous glands [24]. Additionally, gut dysbiosis may contribute to increased IGF-1 levels [12,26]. Considering these mechanisms, the contribution of the gut–skin axis in the pathogenesis of AV has been proposed [12]. Supporting this hypothesis, clinical data have demonstrated that oral administration of *Lactobacillus rhamnosus* for 12 weeks reduced IGF-1 secretion in the skin and improved AV symptoms [27]. Significant reductions in AV lesion counts have also been observed with other oral probiotics, including combinations of *Lactobacillus acidophilus*, *Lactobacillus delbrueckii* subsp. *bulgaricus*, and *Bifidobacterium bifidum*, as well as with *Escherichia coli* Nissle and *Lactobacillus. plantarum* probiotic preparations [28].

Additionally, it has been indicated that some probiotics can persist and successfully colonize the skin, inducing keratinocytes and sebocytes to produce antimicrobial peptides (AMPs) or other metabolites that may directly inhibit or kill pathogens. Considering the above, as well as the markedly increasing use of topical probiotics in skin diseases over the past two decades, randomized controlled trials and clinical investigations were conducted between 2009 and 2024 to examine probiotics for AV treatment [29]. These studies analyzed topical probiotics containing bacterial strains such as *Lactobacillus acidophilus*, *Lactobacillus salivarius*, *Lactobacillus plantarum*, *Lactobacillus paracasei*, *Enterococcus faecalis*, and *Bifidobacterium animalis*. Treatment durations varied, ranging from 4 to 12 weeks. The findings demonstrated that *Lactobacillus* strains, particularly *Lactobacillus plantarum*, significantly reduced acne-related inflammation directly at the site of application and enhanced the healing process [28].

Another chronic inflammatory skin disease with periods of exacerbation is rosacea, characterized by erythema, papules, and pustules, predominantly on the face [29]. The condition occurs in both men and women, with onset usually after the third decade of life. The pathogenesis of rosacea remains unclear, but genetic factors, an abnormal innate immune response, and alterations in the skin microbiota are recognized as contributors [30]. Although microorganisms may not be the central causative agents, emerging evidence suggests that skin dysbiosis, acting as a potentiator of inflammation or as a trigger factor, contributes to disease progression. The colonization of the skin by *Demodex folliculorum* mites, together with their associated bacteria such as *Bacillus oleronius*, has been impli-

cated in the pathogenesis of rosacea [5,31]. This microbial presence has the potential to activate Toll-like receptor 2 (TLR2), thereby exacerbating the inflammatory process characteristic of rosacea [32]. Gut dysbiosis, within the framework of the gut–skin axis, is also thought to play a role in rosacea. In particular, *Helicobacter pylori* infection and small intestinal bacterial overgrowth (SIBO) have been associated with disease development [33]. The eradication of SIBO has been shown to improve rosacea symptoms. These findings provide a rationale for the use of oral probiotics in this condition, as they promote a healthier microbial balance, which may help reduce systemic inflammation and improve skin condition. Reports to date document that oral administration of probiotics such as *Escherichia coli* Nissle, certain strains of *Lactobacillus*, *Bifidobacterium*, and *Saccharomyces* has been associated with more frequent clinical remission and symptomatic improvement in patients with rosacea [32].

Moreover, topical probiotics are suggested to have anti-inflammatory activity, strengthening skin barrier function, directly enhancing its properties, and locally modulating the immune response [32]. However, the use of probiotics in the treatment of rosacea remains relatively limited. Further clinical trials employing both oral and topical probiotics are therefore necessary to assess the long-term therapeutic outcomes.

Another chronic and relapsing immune-mediated inflammatory skin disease is psoriasis. This condition often occurs within families and has a hereditary component. Psoriatic lesions are characterized by keratinocyte hyperproliferation, resulting in marked keratinocyte hyperplasia [34]. Despite advances in systemic pharmacological therapies, the long-term management of psoriasis remains ineffective. Analysis of psoriasis pathogenesis has revealed its frequent coexistence with gastrointestinal diseases, such as inflammatory bowel disease (IBD) and also gut dysbiosis [12,20]. Through the bidirectional interaction between the gut and skin, the gut–skin axis may exacerbate systemic inflammation by promoting the release of proinflammatory cytokines [12]. Considering the potential role of gut microbiota modulation, probiotics have emerged as a novel therapeutic approach in psoriasis management. In randomized clinical trials conducted to date in adults, oral administration of multi-strain probiotics (*Lactobacillus acidophilus*, *Bifidobacterium bifidum*, *Bifidobacterium lactis*, *Bifidobacterium longum*) or a single strain (*Lactobacillus rhamnosus*) has been investigated [35]. These studies demonstrated that probiotic treatment in patients with psoriasis reduces inflammation, improving outcomes measured by the Psoriasis Area and Severity Index (PASI) and the Dermatology Life Quality Index (DLQI), while also contributing to the restoration of skin health [35]. However, further research in this area is necessary, particularly with consideration of an integrated strategy combining probiotics with conventional psoriasis therapy.

Summary

In summary, this study presents data indicating that probiotics may be useful in the management of chronic bacterial infections. Oral probiotics help maintain a healthy intestinal flora and reduce systemic inflammation, while topical probiotics can directly alleviate local inflammation. The application of both oral and topical probiotics represents a novel approach for the treatment of chronic inflammatory skin diseases, including atopic dermatitis, acne vulgaris, rosacea, and psoriasis. The administration of both oral and topical probiotics constitutes a novel therapeutic strategy for chronic inflammatory skin diseases, including atopic dermatitis, acne vulgaris, rosacea, and psoriasis, which frequently involve facial skin. Probiotics confer beneficial effects on skin health by modulating inflammatory pathways and improving facial aesthetics.

Declarations

Conflict of interest statement
The authors declares no conflict of interest.

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SYSTEMATIC REVIEW

Aesthetic aspects in the process of individual hearing aid fitting

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ABSTRACT

This paper presents the possibilities of contemporary hearing prosthetics, encompassing a broad spectrum of solutions currently available to patients. Based on the authors' clinical experience and data from international research centers, the most important aesthetic aspects from the patients' perspective are identified and discussed. The paper reviews types of hearing aids in clinical use, their applicability depending on the type and severity of hearing loss, and the degree of device miniaturization. The dominant preferences in hearing aid selection include aesthetic appeal and discretion, as well as options for wireless connectivity and control via mobile applications. Owing to the development of wireless technologies in hearing aids, patients increasingly opt for solutions that enable device management and access to the internet and multimedia through smartphones. Furthermore, the availability of colorful housings and earmolds has led to an emerging trend in which hearing aids are used to emphasize the individual style of the wearer.

Keywords: face aesthetic, hearing aids, earmoulds.

Introduction

Advances in technology and the miniaturization of electronic devices have enabled increasingly discreet solutions in the field of hearing aids. These developments respond to patients' expectations for hearing rehabilitation tools that effectively compensate for hearing impairment while remaining minimally noticeable. Contemporary miniaturization and the continuously increasing processing capacity of modern processors make it possible to design highly discreet hearing aid systems.

Hearing loss affects individuals across the entire age spectrum, including children, adolescents during their educational period, professionally active adults, and particularly older adults. In the latter group, age related hearing

loss (presbyacusis) is most common; it typically manifests as high frequency hearing impairment associated with aging of the auditory system [1] and prolonged exposure to multiple iatrogenic and environmental factors.

Despite differences in age and lifestyle, patients share similar expectations: restoration of effective communication with their surroundings and achieving this goal in a manner that is as unobtrusive as possible. Contrary to common assumptions, cosmetic considerations play a crucial role, as they significantly influence acceptance of hearing aids and daily wearing time. Both factors have a substantial impact on the communicative benefits derived from hearing aids as well as on the effectiveness of auditory rehabilitation and revalidation.

Material and methods

This study presents a review of available solutions addressing the aesthetic aspects of hearing aids, which constitute a key concern for patients. In cases of sensorineural hearing loss and a wide range of mixed hearing losses (in which deficits in sound transmission coexist), air conduction hearing aids are the primary method of compensating for impaired auditory perception.

Behind the ear (BTE) hearing aids are the most commonly used devices (see **Figure 1a**).

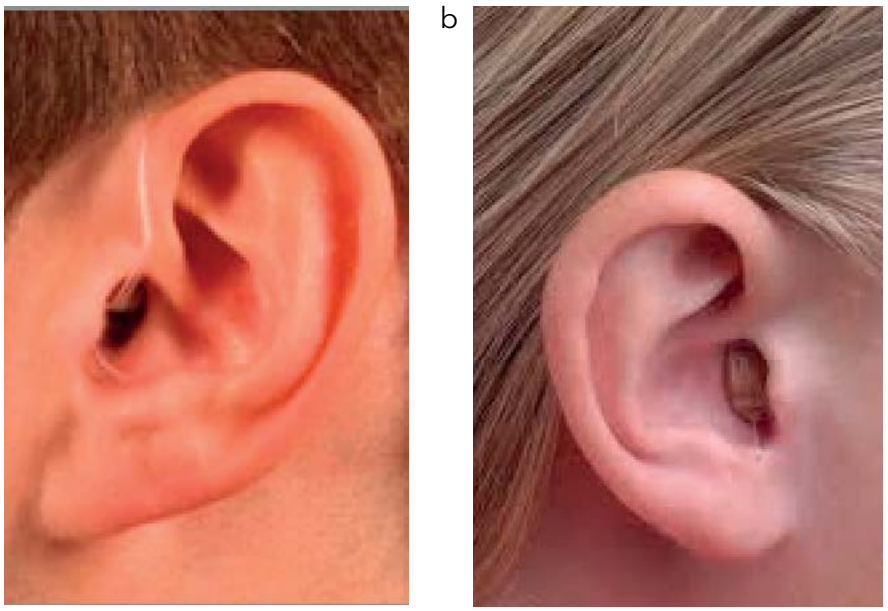
In patients with lesser degrees of hearing loss, various in the ear (ITE) solutions are available (see **Figure 1b**).

Technological development and aesthetic considerations- in recent years, BTE hearing aids have undergone a profound technological transformation, both in terms of miniaturization and the sophistication of acoustic signal processing. Thin sound tubes are now widely used, as well as solutions in which the receiver is placed directly in the external auditory canal and connected to the hearing aid housing by an extremely thin electrical wire, replacing the traditional acoustic tube.

Compared with classical sound tubes and full earmolds, these solutions provide greater discretion and improved user comfort. Such miniaturized designs have been made possible by the dynamic development of feedback cancellation systems. Previously, tightly fitting full earmolds were required to acoustically isolate the amplified signal delivered to the external auditory canal and prevent it from being re captured by the microphone, which caused audible feedback. These older solutions were often conspicuous and compromised user comfort due to their size and visibility.

Modern feedback management systems allow for the use of open fittings and thin wires without sacrificing acoustic performance. As a result, the current generation of BTE hearing aids with the receiver located in the ear canal

a b



▲ Figure 1. Hearing aids a) Behind The Ear (BTE) b) In The Ear (ITE).

(RIC – Receiver in the Canal) is often more discreet than in the ear devices, while offering greater technical capabilities and considerably easier handling (see **Figure 2**).

Color, personalization, and design trends-considering aesthetics, device invisibility, and patient acceptance, manufacturers offer a wide range of housing color options. The color of the casing is often matched to hair color (e.g., black, white, brown, champagne), whereas brightly colored housings with decorative motifs are commonly offered for children (see **Figure 3**).

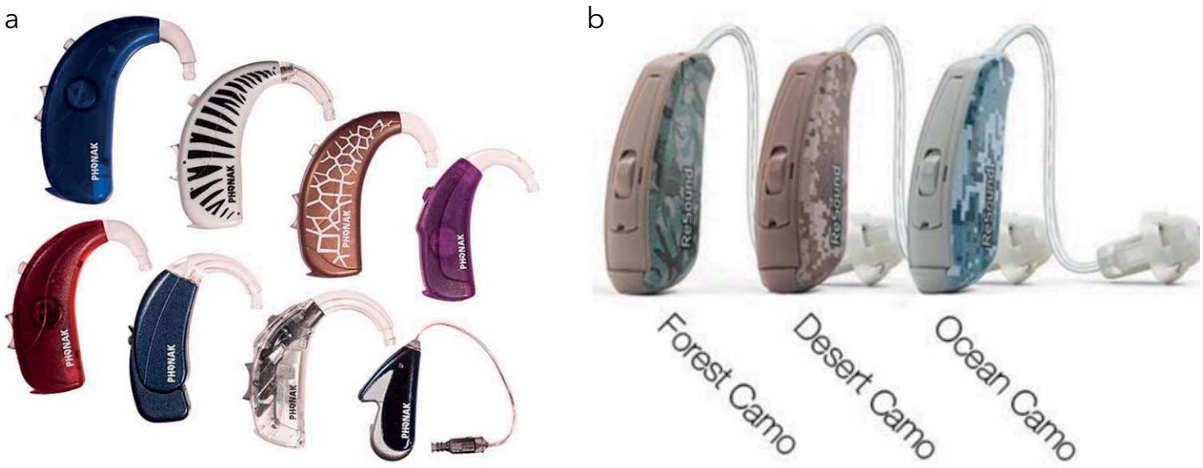
These approaches reflect two primary aesthetic strategies driven by patient preferences: maximizing invisibility or intentionally highlighting the hearing aid as a decorative element. In recent years, colorful housing designs have gained increasing popularity, particularly among children and adolescents (see **Figure 4a**).

Among professionally active adult users, a parallel trend has emerged in which hearing aid colors are selected to complement clothing, jewelry, and an active lifestyle. Due to their small size and wide color palette, hearing aids are increasingly perceived as accessories that enhance an individual's dress style rather than merely medical devices.

This shift is associated with growing public awareness and an increasing prevalence of hearing aid use. As the number of users rises, aesthetic evaluation of hearing aids becomes more common, similarly to eyeglasses. In both hearing prosthetics and optical correction, devices may emphasize personal style, hair color, or facial features. The importance of the issues addressed by the patient and professional community is significant. Global and European organizations are increasingly addressing the issue of changing the way we think about perceptual and cognitive impairments. This is especially true given the increasing prevalence of these issues, which now affect hundreds of millions of people worldwide. Current examples include debates on changing the way we think about hearing loss and World Hearing Day at

▲ Figure 2. Hearing aids type Receiver In the Canal (RIC).

▲ Figure 3. Examples colored housings of hearing aids.



▲ Figure 4. Examples design of behind the ear type of hearing aids.

the European Parliament. Polish representatives, including both hearing care professionals and manufacturers, are actively participating in these activities.

Digital manufacturing and wireless technologies- special attention should be given to the role of 3D printing in the production of earmolds and custom in the ear hearing aid shells. Currently, the entire production process is conducted digitally, based on scans of the external auditory canal or digitized ear impressions. This approach allows for highly precise computer aided design using dedicated software in otoplastic laboratories.

The final stage involves high quality 3D printing. Both openwork earmolds and full shell designs with precisely controlled ventilation can be produced. Ventilation is particularly important for otological reasons, including maintaining appropriate microbiological conditions in the external auditory canal and reducing the acoustically unfavorable occlusion effect. Colors may be selected according to patient preference, ranging from transparent to multicolored designs, with the option of incorporating decorative elements that match hearing aid housings or personal jewelry.

At present, two dominant trends can be identified: highly discreet hearing aid fittings achieved through miniaturization and color matching, and deliberate accentuation of personal style through color, treating hearing aids as distinctive accessories. Similar tendencies are observed in eyewear optics, where frames are either minimalist or designed to highlight facial features and preferred color schemes. Invisible operation of hearing aids is a priority for both patients and manufacturers. Thanks to wireless transmission from external devices to hearing aids—most commonly implemented via Bluetooth and Wi-Fi protocols—it is possible to rapidly transmit audio signals from external sources such as wireless microphones, streamers, and mobile phones. These capabilities, combined with the development of dedicated smartphone applications, allow users to exercise comprehensive control over their hearing aids in a manner that remains imperceptible to others. Functions such as volume adjustment, program selection, and adaptation of hearing aids to various acoustic environments (e.g., concerts, cafés, workplaces; situational or comfort programs) are now primarily integrated into smartphone applications. Telephone calls, as well as audio streaming from social media platforms, internet services, and podcasts, are also conducted wirelessly in a way that is inconspicuous to surrounding individuals.

The new Bluetooth Low Energy (LE) data transmission technology requires minimal battery power in hearing aids while enabling efficient digital data transfer. In the near future, the Auracast system will allow hearing aid users to access millions of broadcast points and hotspots in public venues such as railway stations, airports, museums, information centers, cinemas, and many other locations. In light of these technological solutions, the concept of hearing loss as an "invisible impairment" acquires a fundamentally new meaning—an invisible impairment that is fully compensated in terms of communicative functioning.

Results and discussion

The aesthetics of modern hearing aids are shaped by two contrasting yet equally prevalent trends: complete discretion and contemporary design that aligns hearing aids with elegant technological gadgets or jewelry.

The principal aesthetic trends include:

- Discretion (invisibility, camouflage): In the ear (ITE) and completely in the canal (CIC) hearing aids are the smallest available devices and are positioned deep within the ear canal, rendering them virtually undetectable. These devices are suitable for moderate hearing loss, sufficient ear canal dimensions, and adequate manual dexterity.
- Technological minimalism: Behind the ear devices, particularly RIC models, have become progressively smaller and slimmer. Their appearance often resembles modern wireless earbuds, which helps reduce the stigma associated with hearing impairment.
- Personalization and jewelry inspired design: Manufacturers provide extensive color options, ranging from skin and hair matching shades to metallic finishes such as gold and silver, allowing hearing aids to function as stylistic accessories.

In the publication Consumer Perspectives on Improving Hearing Aids [4] a qualitative study demonstrated that patients appreciate technological progress; however, they also expect improvements in aesthetics, user control over device settings, and sound clarity. An important factor identified in this study is the development of trust between the patient and the hearing care professional, a relationship characteristic of most medical professions. User Preferences for Hearing Aid Features [5] is a dissertation analyzing differences between premium-class and basic hearing aids. Despite the absence of objective differences in speech understanding test outcomes, the majority of patients preferred premium models due to additional features, such as compatibility with remote fitting and access to media services (internet connectivity, Bluetooth 5.0 LE, and smartphone application control). According to the authors' own observations, patient age is often not a limiting factor. Widespread access to smartphones and increasingly intuitive application interfaces significantly enhance the accessibility of modern wireless technologies.

In Factors Influencing Hearing Aid Use, Benefit and Satisfaction [6], a systematic review of 46 articles published over the past decade identified the main determinants of satisfaction as hearing sensitivity, patient attitudes and beliefs, and social support from close relatives. The study Listening Preferences of New Adult Hearing Aid Users [7] revealed that new users often prioritize physical comfort during the initial fitting over maximal sound clarity. Preferences varied depending on whether comfort or precision of hearing in noisy environments was considered the primary goal.

In Consumer Preferences for Hearing Aid Attributes [8] analysis showed that patients are willing to pay significantly more for devices that provide improved functionality in noisy environments. This functionality was found to be twice as important as other attributes when making purchasing decisions The Study Preference and Outcomes for Fast vs. Slow Compression [9] suggests that the degree of hearing loss directly influences technical preferences. Patients with more severe hearing impairment more frequently prefer slower compression speeds, which in turn affects overall satisfaction with hearing aid performance.

In Satisfaction with Hearing Aids Based on Technology and Style [10] shows a correlation was confirmed between high satisfaction with personal image and the selection of in-the--ear (ITE) hearing aids. The aesthetics of "self--image" emerged as a key subscale of overall satisfaction. The Study Impact of Hearing Aid Technology Level [11] indicated that although premium technology provides slightly better subjective perceptions of hearing quality, differences compared to basic models may be difficult for patients to discern in everyday life. In Factors in Client–Clinician Interaction [12], a concept-mapping study demonstrated that the most influential factor in the decision to purchase a hearing aid is ensuring patient comfort and the clinician's understanding of the patient's individual needs).

Conclusions

Based on the authors' clinical experience, a review of the literature, and data from hearing care professionals, the following conclusions can be drawn:

- Technological advances enable hearing care professionals to offer solutions that take into account individual facial aesthetics and personal preferences.

- Personalized selection of hearing aid type, housing color, and earmold design effectively addresses expectations related to lifestyle and self image.
- An increasingly observed trend combines device miniaturization that ensures discreet use with personalization that emphasizes individual style.
- Patients frequently choose hearing aids that provide direct access to multimedia content and smartphone based control.

Declarations

Conflict of interest statement
The authors declares no conflict of interest.

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NARRATIVE REVIEW

The face in japanese aesthetic categories: modification practices and their meanings

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ABSTRACT

Japanese aesthetics are based on values distinct from Western traditions, affirming irregularity, ambiguity, impermanence, and simplicity. Categories such as *wabi-sabi* and *kawaii* shape local understandings of beauty by emphasizing naturalness, authenticity, and emotional warmth. Within this context, historically established aesthetic practices such as tooth blackening (*ohaguro*), the traditional removal of natural eyebrows and the drawing of new ones higher on the forehead (*hikimayu*), or the contemporary trend of intentionally shaping dental irregularities (*yaeba*) are not merely fashions but performative gestures embedded in local categories of beauty. They manifest values that stand in contrast to the global pursuit of symmetry and perfection, highlighting the cultural role of the body as a carrier of meaning, identity, and social expectations.

Keywords: facial aesthetics, *wabi-sabi*, *kawaii*, *yaeba*, *ohaguro*.

Introduction

Japanese aesthetics locate beauty in values not always intuitive to external observers, such as irregularity, understatement, impermanence, and empty space. It is a cultural sphere in which seemingly contrasting values coexist harmoniously. The cultural dimension of beauty is perfor-

mative – it both presents and actively creates qualities valued within the community. Beauty norms promoted by global media often refer to Western standards of attractiveness [1].

The aim of this paper is to present aesthetic categories demonstrating that local Japanese aesthetics differ from globally recognized ideals. The article argues that historically rooted traditional practices tooth blackening (*ohaguro*), the traditional removal of natural eyebrows and the drawing of new ones higher on the forehead (*hikimayu*), or the contemporary trend of intentionally shaping dental irregularities (*yaeba*) are not merely aesthetic trends but manifestations of deeply embedded Japanese categories of beauty such as *wabi-sabi* and *kawaii*, which historically and presently function in opposition to global ideals of symmetry and perfection.

Wabi-sabi

The aesthetic category known as wabi-sabi finds beauty in the aesthetics of experience, in imperfection, changeability, and incompleteness. Unconventional things are considered unique, and therefore beautiful. The category of *wabi-sabi* is associated with tea ceremonies that have been practiced for centuries under the influence of Zen Buddhism [2]. The ritual of the tea ceremony extends to the entire experience as well as to the architecture surrounding the event. This category is broad enough to encompass the simplicity of natural objects, the feeling of an uneven surface beneath the fingertips, as well as the beauty of the passage of time. Rust on an object, the potter's fingerprint on a fired vessel, a naturally uneven and rough branch of a blooming cherry tree all contain charm, beauty, and the potential of delicate flowers. Likewise, a child's smile, with uneven or still missing teeth, conveys such warm beauty. The body is also perceived through the prism of this category – in its naturalness and transience. Moreover, the strong need to belong to society in Japan makes the body an object shaped culturally. The body is not perfect; it is unique, it bears the marks of time, and naturalness and irregularity provide a sense of authenticity. According to *wabi-sabi*, the passing of human existence is not necessarily something to be seen as a loss [3]. The deliberate shaping of the body in such a way that it expresses naturalness aligns with the local canon of beauty.

Kawaii

Following this image of serene and warm beauty, the aesthetic category of *kawaii* (cute, sweet, nice) emerges. It is a category that defines the image of beauty not only in contemporary culture, but has been known in Japan for several centuries [4]. The word *kawaii* is used mainly as an adjective describing people or things. Historically, the meaning of this term was associated with the blush on the faces of embarrassed young people, and later it began to be linked with feelings of pity, love, tenderness, and care toward weaker members of society [4]. Hiroshi Nittono, in the article "The Two-Layer Model of 'Kawaii:' A Behavioural Science Framework for Understanding Kawaii and Cuteness," defines this category in an ambiguous way – as an emotion and as a socially shaped value. He relates it to positive emotions that arise when observing a small child and to the social need to protect and support individuals who evoke such feelings [4]. According to Reina Takamatsu, being cute makes society care for a given person. Such individuals evoke sympathy, care, and kindness [5]. It is also a tool for expressing the desire to belong to society. Kawaii also functions as a tool of foreign policy. In the years 2009–2010, the Ministry of Foreign Affairs of Japan appointed "Kawaii Ambassadors," whose aim was to promote Japanese culture around the world [4]. The aesthetics of *kawaii* are known from manga and anime, and one of the most characteristic figures, present since the last century, is Hello Kitty, an anime character recognized globally. In Japan, the character is visible in many official spaces, for example on trains to Kyoto. Another example of the use of *kawaii* in social and administrative space is the assignment of symbolic characters to individual cities in Japan. Cartoon characters assigned to cities, towns, as well as villages are used in official government correspondence and are reflected in everyday objects, such as manhole covers. This category evokes strong and positive reactions from audiences, which is also why it remains popular in Japanese society.

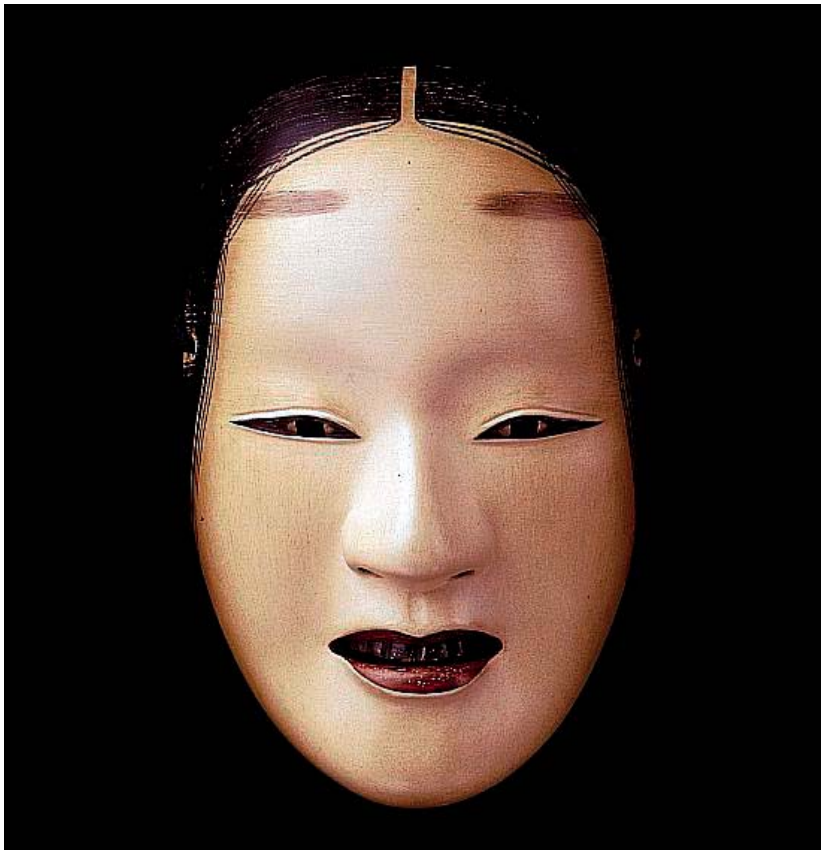
Ohaguro

Proof that local canons of beauty may differ significantly from global ones is the custom of blackening the teeth. It was practiced not only in Japan, but also in other countries of East Asia.

The tradition of teeth blackening, called *ohaguro*, consisted of painting the teeth with a solution made from iron filings mixed with sake, vinegar, and plant-based dyes [6]. The shine of the uniform black pigment resembled lacquer, highly valued in Japan. In Japan, black is the color of elegance, formality, and maturity. Historically, it was not associated with funerals – in Shinto, white is the color of the funeral kimono and symbolizes both purity and mourning. As early as the 8th century, there were mentions of women, men, and children at court who practiced teeth blackening. Interestingly, even a samurai before battle made sure that his teeth were carefully blackened [6]. This custom was deeply rooted in court culture. Masks in traditional *Nō* theatre (see **Figure 1**), performed mainly for the samurai class, also have dark teeth. Teeth blackening was a sign of maturity, and over time the practice became limited exclusively to women after the age of 18. Later, the custom also symbolized marital fidelity [6]. It was also intended to protect the teeth and gums from disease. An additional advantage was the favorable color contrast with a white face and red lips. The absence of visible teeth, which could be associated with aggression, was considered a sign of elegance and etiquette. White teeth did not constitute an ideal of beauty – they were perceived as animalistic and associated with primitive aggression. Grace was expressed by covering the mouth while laughing (behavioral etiquette). The custom of teeth blackening was banned by the Meiji government in 1870 [7,8], after the opening of Japan to the Western world. The performative character of *ohaguro* lay in the fact that it was a cultural act that functioned socially by signaling status, maturity, and marital fidelity. Both the tradition of *ohaguro* and contemporary *yaeba* indicate the cultural significance and performativity of the smile as a socially regulated gesture (see **Figure 2**).

Hikimayu

Hikimayu is a traditional Japanese cosmetic practice consisting of shaving the natural eyebrows and painting new ones much higher on the forehead (see **Figure 1**). This originally Chi-



▲ Figure 1. Historical representations of *ohaguro* and *hikimayu* as illustrated by a mask from traditional *Nō* theatre. Source: https://i.pinimg.com/736x/6e/44/8e/6e448e8f80c070f3b9fe8b5461053b65.jpg

▲ Figure 2. Contemporary applications of the *ohaguro* and *hikimayu* practices. Source: https://t1.daumcdn.net/cafeattach/1lHuH/2f8051f8b5db194f717e5df79a0377df2227e1ef

nese tradition reached Japan during the Heian period (794–1185). The oval or round shape of the eyebrows was meant to emphasize grace and elegance. By the Edo period, in a slightly different form, it was commonly practiced by noble women. The tradition of removing the eyebrows – or, in contemporary terms, covering them with a waxy substance (in traditional makeup) – also had a practical dimension, as eyebrow hair did not look aesthetically pleasing with face makeup based on whitening the skin with powder mixed with water (*oshiroi*). Painted eyebrows served as a clear sign of maturity and social status, as well as an element of an aesthetic that emphasized refinement and the emotional restraint inherent in the ideal of Japanese femininity (see **Figure 2**). *Hikimayu*, alongside practices such as *ohaguro*, highlighted the symbolic detachment of appearance from "naturalness" and the subordination of the body to the cultural norms of the time [9]. In contemporary research on emotional expression and facial aesthetics, Japanese people often make stronger use of the eye and eyebrow area to express emotions and assess attractiveness than, for example, Americans [10].

Yaeba

The example of *ohaguro* is not the only historically known method in Japan of enhancing women's appearance through interference with the look of their teeth. Another example of striving to achieve a particular social reception resulting from being *kawaii*, and of the influence of this aesthetic on appearance, is the deliberate shaping of teeth based on creating irregularity, namely *yaeba*. *Yaeba* means a multilayered or double tooth [11]. This trend began in 2011, when many fans wanted to resemble the actress and singer of the group AKB48, Tomomi Itano [12]. The phenomenon persisted among young women who deliberately wished to obtain a smile like that of the artist. An irregular arrangement of teeth is associated with an aesthetic of beauty based on unevenness and *kawaii*. There is a certain paradox in this, because emphasizing natural beauty through imperfection is not the work of nature, but of a professional. The uniqueness associated with naturalness also remains in contrast to the precise replication of the trend and the actress's image (see **Figure 3**). The process of creating *yaeba* is planned in eve-

▲ Figure 3. A girlish *yaeba* smile. Source: https://rocketnews24.com/wp-content/uploads/sites/2/2021/02/IMG_1594.jpg?resize=1024,768

ry detail, and there is little room for uniqueness. The sense of authenticity evoked by this type of smile is illusory, since in selected variants of *yaeba* the additional dental overlays can be removed at any time.

Yaeba causes a person to be perceived through the prism of beauty categories specific to their society, culture, and distinct aesthetic tradition. While globally beauty is framed through correction and the pursuit of symmetrical perfection, in Japan there is also a styling of imperfection. Such an arrangement of teeth gives the smile features associated with a child's natural smile, which increases trust as well as feelings of care or the need to look after a given person [4]. Mainly young women choose this way of shaping their smile, which means that their image is sometimes simplified to childlike and less threatening. Harmony in Japanese society has enormous cultural significance, and a pleasant and non-threatening image conveys a sense of predictability and calm. Moreover, the beauty of the transient world, known from Zen Buddhism and for centuries preserved in *ukiyo-e* woodblock prints (pictures of the floating world), constitutes another example of how youth is valued for its ephemerality. This can be compared to the previously mentioned branch of a cherry tree or, even more aptly, to the flower of the blooming cherry tree (*sakura*), which is a symbol of Japan. *Sakura* is a representative example of this kind of beauty, because at the moment of full bloom its petals are carried away by the wind, and the fullness of its bloom quickly disappears.

Beauty norms associated with *kawaii* also influence the shaping of the *yaeba* trend. People perceived as cute evoke positive emotions, which constitutes an advantage that may translate into real benefits, including material ones. A cute person may find it easier to receive a job offer or to find a wealthy partner. A certain kind of social pressure connected with the functioning of the categories *tatemae* and *honne*

means that the choice of the *kawaii* aesthetic is not always entirely free. In order to fit into social norms and be accepted, one must function in two dimensions: *tatemae*, that is, the official stance that maintains harmony and proper behavior – in the case of *yaeba* aesthetics signaling gentleness and approachability – and *honne*, that is, true thoughts and behaviors that are not revealed publicly. Perhaps this is why non-permanent forms of *yaeba*, which can be removed at night or while eating, allowing one to maintain a distinct public and private image, are so popular among supporters of this trend. The performative character of *yaeba* lies in the fact that appearance plays a social role and communicates youth, approachability, and gentleness, thereby aligning with the *kawaii* aesthetic.

Conclusions

In conclusion, the traditions described in the article demonstrate that beauty is relative and constitutes a manifestation of aesthetic categories embedded in local culture. In Japan, beauty has many dimensions that seem to contradict global aesthetic trends. Historically rooted traditional practices such as *ohaguro* and *hikimayu*, as well as the phenomenon of *yaeba*, show that beauty in Japan is not merely a visual matter, but also a tool of social relations, emotions, and cultural expectations. These practices reveal how diverse and counterintuitive aesthetic categories are and how greatly the local understanding of beauty differs from global norms based on perfection. The traditional blackening of teeth (*ohaguro*), the painting of new eyebrows (*hikimayu*), and the custom of deliberately forming dental irregularities (*yaeba*) confirm the distinctiveness of Japanese aesthetic sensibility, focused on imperfection, transience, and subtlety.

Declarations

Conflict of interest statement
The authors declares no conflict of interest.

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