Journal of Health and Rehabilitation Research 2791-156X JHRR

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Original Article

Assessing Smile Line Aesthetic Impact in Complete Denture Wearers from the Perspective of Laypersons

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Conflict of Interest: None.

*Kayani AT., et al. (2023). 3(2): **DOI**: https://doi.org/10.61919/jhrr.v3i2.698*

ABSTRACT

Background: The aesthetic dimension of a smile holds a paramount influence in social interactions and personal confidence. With the rise of cosmetic dentistry, there is an increased demand for understanding the public's perception of dental aesthetics, especially concerning complete denture wearers. Previous studies have highlighted the importance of the 'smile line', yet there remains a gap in comprehensive knowledge regarding layperson perspectives, particularly within specific cultural contexts.

Objective: This study aims to elucidate the aesthetic preferences of laypersons towards the smile line in complete denture wearers, contributing to a patient-centered approach in prosthodontic treatment.

Methods: A descriptive cross-sectional study was conducted at Liaquat University of Medical and Health Sciences in Jamshoro. The sample comprised 186 individuals, selected via non-probability consecutive sampling. Participants between 18 to 70 years of age from both genders, excluding those with visual or developmental impairments, were included. Digital photographs of smiles with complete dentures were manipulated using Adobe Photoshop to represent varying degrees of incisal and gingival exposure. The images were assessed by the participants, who were asked to rank them according to aesthetic preference. Data analysis utilized SPSS version 25, employing chi-square tests for significance, with a p-value ≤ 0.05 considered significant.

Results: Image F was deemed most attractive, with 20 (10.75%) votes, while Image G followed closely with 21 (11.29%) votes. Image J was considered least attractive, with 24 (12.90%) votes. The distribution of preferences exhibited a broad range of individual variations, demonstrating the complexity of aesthetic perceptions among laypersons.

Conclusion: The study highlights a diverse range of preferences in smile aesthetics among the general population, emphasizing the need for personalized treatment approaches in the fabrication of complete dentures. Understanding these preferences can significantly enhance patient satisfaction and treatment outcomes.

Keywords: Dental Aesthetics, Smile Line, Complete Dentures, Layperson Perception, Prosthodontics, Cosmetic Dentistry, Patient-Centered Care, Smile Design, Cultural Dental Preferences.

INTRODUCTION

The aesthetic appeal of a smile, integral to facial harmony, has long been recognized for its profound impact on social interactions. The pursuit of an attractive smile, transcending mere beauty, significantly influences social judgments and decisions (1,2). In recent times, the focus on smile aesthetics has intensified within dentistry, with patients gauging the success of their dental treatments by the enhancements in their smile. This shift is supported by the belief that individuals with appealing smiles are more likely to be socially accepted (3). The aesthetics of a smile are determined by several factors, including lip positioning, tooth exposure, alignment of front teeth, the dental midline, and the balance between gingival tissues and teeth. Lips, framing the smile, are affected by their length and the individual's age and gender (4,5). Additionally, the appearance of a smile is influenced by teeth attributes like color,

size, alignment, and their relationship with adjacent teeth, while gingival health, encompassing height, shape, color, and margins, is essential for maintaining a balance between tooth and gum aesthetics (6).

The restoration of a smile, particularly in the anterior region, requires a deep understanding of the interplay between teeth and soft tissues, with the "smile line" playing a pivotal role in successful anterior restorations, including complete dentures (9). Factors such as axial incisor angulation and buccal corridors, along with gingival tissue balance, may necessitate surgical or orthodontic interventions for an aesthetically pleasing smile (10,11). In cosmetic dentistry, while professionals aim for a "gold standard," their focus on intricate interventions may not align with patients' perspectives, who often prioritize teeth and lips over gingival aesthetics (12). Given the subjective nature of aesthetic judgments, understanding the layperson's view on the smile line's aesthetic impact is vital for achieving treatment outcomes that satisfy patient expectations (13). The creation of the perfect smile with complete dentures demands a personalized and precise approach, tailored to the unique characteristics of each patient (14-16).

Research on the perception of smile line aesthetics among complete denture wearers has been limited. A foundational study by Pithon in 2005 revealed a preference for unaltered smile line images across different age groups in Brazil, indicating a general appreciation for natural smile aesthetics (17). However, the understanding of smile line perception among Pakistani complete denture wearers remains scant. This study seeks to address this gap by examining the layperson's perspective on smile line aesthetics in the Pakistani population, aiming to provide valuable insights into cosmetic dentistry and enhance our comprehension of aesthetic preferences across diverse cultural contexts.

MATERIAL AND METHODS

This study was conducted within the Department of Prosthodontics Dental OPD at Liaquat University of Medical and Health Sciences, Jamshoro, employing a descriptive cross-sectional design to facilitate the comprehensive collection of data. The objective was to assess the aesthetic impact of the smile line in complete denture wearers from the perspective of laypersons. To ascertain a representative sample, the WHO calculator was utilized, considering a 14% statistical significance level, a 5% margin of error, and a 95% confidence interval, culminating in a sample size of 186 participants. A non-probability consecutive sampling method was adopted, with inclusion criteria allowing for individuals aged 18 to 70 years from both genders, and attendants acting as laypersons. Conversely, individuals presenting with visual impairments, syndromes, or developmental abnormalities were excluded from participation.

Upon receiving ethical approval in accordance with the Helsinki Declaration, as ratified by the CPSP, the study was initiated. Participants, comprising patients and their companions who met the inclusion criteria, were incorporated after providing informed consent. Data collection entailed capturing a frontal intra-oral photograph of each participant's smile, featuring complete maxillary and mandibular dentures to include teeth, gingiva, and lips. These images were taken using an iPhoneX camera, secured on a tripod under consistent lighting conditions, and from a distance of two feet. Digital alterations of these images were subsequently performed utilizing Adobe Photoshop 7, focusing exclusively on the maxillary denture. These modifications simulated a progressive downward shift of the upper lip and an alteration in the exposure of the incisal edge by 1 mm increments. The altered images were randomized, printed on photo paper, and coded with alphabets. Participants were then presented with these images and asked to identify and select the most and least attractive images according to their perception.

For the analysis phase, data was processed using SPSS version 25, marking an update from the initially planned version 23 to accommodate the most recent statistical methodologies. Quantitative variables, such as age, were analyzed to determine mean and standard deviation, whereas qualitative variables, including gender and perceived attractiveness, were evaluated through frequency and percentage assessments. The study also implemented stratification to consider the potential influence of effect modifiers like age and gender, followed by post-stratification chi-square tests to identify any significant associations, with a significance threshold established at $p \leq 0.05$. The types of smile alterations crafted for the analysis included variations in incisal coverage and gingival show, ranging from 0 mm to 7 mm in incisal coverage and 1 mm to 2 mm in gingival show.

RESULTS

The integrated summary of the study's results reveals a nuanced landscape of aesthetic preferences in smile design among complete denture wearers. The demographic data indicate a skew towards younger participants, with the 18-25 and 26-30 age groups being the most represented at 52 (27.96%) and 49 (26.34%) participants, respectively. The middle age bracket of 31-40 years held 39 (20.97%) participants, while the 41-50 and above 50 age groups had a smaller presence with 24 (12.90%) and 22 (11.83%) individuals, respectively. Gender distribution showed a female majority, with 109 (58.60%) female participants against 77 (41.40%) male participants.

When assessing the smile aesthetics from the images presented, preferences varied. Image F, with 20 (10.75%) votes, was the most favored for its attractive depiction of the smile line. Image G was a close contender, receiving 21 votes but with a slightly higher preference rate of 11.29%. Image K also stood out with 16 (8.86%) votes, signaling its appeal. Contrastingly, Image J, seen as the least attractive, received 24 (12.90%) votes, indicating a consensus on its lower appeal. Image H had a balanced distribution of votes, receiving 16 (8.60%) for both most and least attractive categories, highlighting polarized views on its appearance.

The remaining images showed varied responses, with Images A and B attracting a moderate number of votes at 9 (4.84%) and 10 (5.38%) for most attractive, while also receiving the fewest votes for least attractive at 4 (2.15%) and 5 (2.69%) respectively. Image C was considered more favorable with 12 (6.45%) votes for most attractive and only 2 (1.08%) for least attractive. Image D was chosen by 6 (3.23%) as most attractive and 3 (1.61%) as least attractive, while Image E, despite being least favored as most attractive with 3 (1.61%) votes, received no votes for least attractive, indicating a neutral reception. Overall, the aggregated results portray a complex array of individual preferences, with certain images consistently favored or disfavored for their aesthetic qualities. This diversity underscores the subjective nature of smile aesthetics and the importance of a personalized approach in cosmetic dental treatment and prosthodontic care.

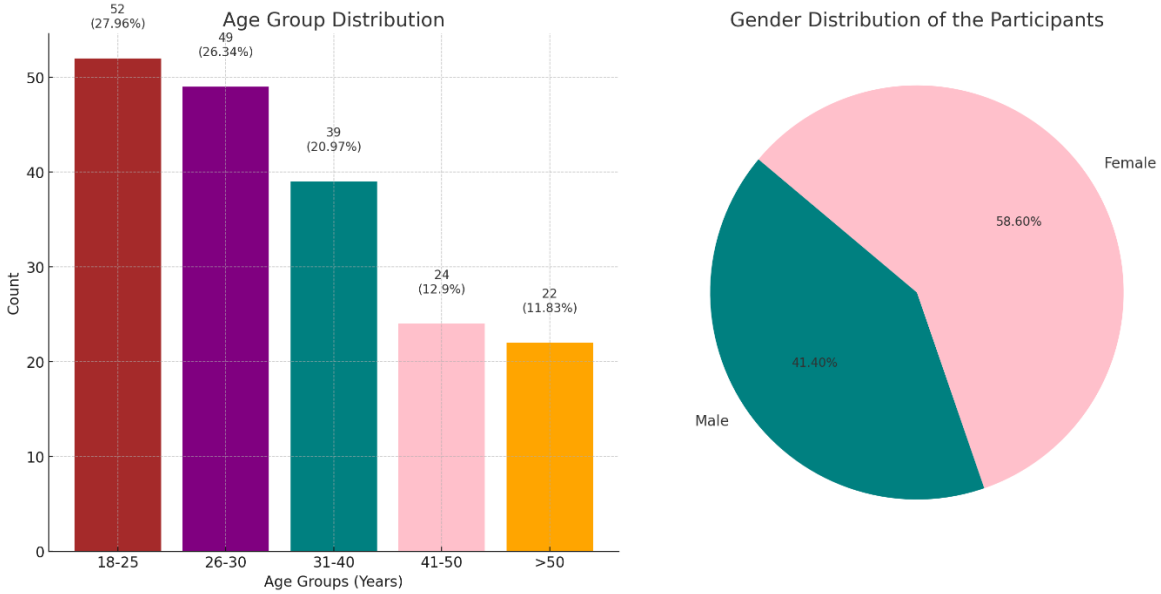

Figure 1 Age and Gender

Table 1 Most and Least Attractive Image

Image	Most Attractive Count	Most Attractive Percentage (%)	Least Attractive Count	Least Attractive Percentage (%)
A	9	4.84	4	2.15
B	10	5.38	5	2.69
C	12	6.45	2	1.08
D	6	3.23	3	1.61
E	3	1.61	0	0.00
F	20	10.75	11	5.91
G	21	11.29	9	4.84
H	16	8.60	16	8.60
J	15	8.06	24	12.90
K	16	8.86	13	6.99

DISCUSSION

The empirical analysis of smile aesthetics has unveiled that the smile serves as a pivotal attribute in facial allure, overshadowing the aesthetic influence of skin tone, symmetry of the eyes and cranium, hair style, and nasal structure when subjected to comparative evaluations. Within the discipline of prosthodontics, the triumph of prosthetic interventions is adjudged not solely on their functional merit but also on their ability to harmonize comfort with aesthetic appeal. Aesthetic considerations in denture fabrication are deeply rooted in a tapestry of socio-cultural fabric, with individuals grappling with edentulism seeking dentures that transcend functionality to embody a semblance of naturalness appropriate for their age (18).

The concept of the 'smile line'—a visually satisfying arc formed by the upper teeth during a smile—is an aesthetic cornerstone in prosthodontic treatments. Achieving this ideal has been a consistent objective in dental restorations. However, there is a paucity of research exploring layperson perceptions of the smile line, particularly in complete denture wearers, save for the study by Pithon et al., which illuminated how aesthetic evaluations of smile lines are influenced by the extent of tooth exposure across different age groups (17). Their findings indicated age-related divergences in preferences, with less acceptance of marked alterations in younger cohorts and a leaning towards minimal tooth exposure in older demographics. Shared aesthetic values were discernible across age groups for specific smile line alterations, suggesting an overarching consensus in smile aesthetics.

Capitalizing on the scant research, our investigation ventured to comprehensively discern the general population's perceptions of smile aesthetics, focusing on the impact of tooth exposure variations in full dental prostheses. Involving 186 participants, the study sought to dissect how particular smile modifications shape aesthetic attractiveness. Distinct inclinations for certain smile alterations emerged, notably, a unanimous preference for the 0 mm incisal exposure, which 21% of participants favored, positing a more natural smile as aesthetically superior. The 1 mm gingival show also drew approval from 19% of respondents, underscoring the impact of minute changes in prosthetic design on smile perception (18).

Conversely, modifications featuring a 3 mm gingival display were consistently deemed least attractive by 46% of respondents, pointing to a general aversion towards excessive gingival exhibition. These results not only resonate with but also extend upon the findings by Pithon et al., enriching the current understanding of patient-centric smile aesthetics (17). The study's strength lies in its reflection of a broad consensus across varied demographic segments, suggesting a universal aesthetic criterion within the sampled population (19-20).

Despite its insights, the research is not without limitations. The subjective nature of aesthetic judgment and the constraints of a cross-sectional design warrant a cautious interpretation. Future investigations could benefit from a longitudinal approach, providing a temporal dimension to understanding aesthetic preferences as they evolve with trends and aging.

The study beckons prosthodontists to adopt a patient-centric approach, tailoring denture designs to individual aesthetic desires to enhance patient satisfaction. Transparent dialogue with patients regarding their expectations and integrating these preferences into treatment planning is paramount. This study underscores the need for clinicians to prioritize personalized aesthetics in denture fabrication, as it can substantially elevate patient contentment and quality of life for complete denture wearers. The findings serve as a compass for future research and clinical practices, guiding towards a nuanced understanding of patient preferences in dental aesthetics.

CONCLUSION

The findings of this study underscore the subjective nature of dental aesthetics, revealing a spectrum of preferences among laypersons regarding the smile line in complete denture wearers. The most favored alterations suggest a trend towards moderation in smile design, with both the most and least attractive images offering valuable insights into societal perceptions of an ideal smile. These insights carry significant implications for healthcare, particularly in the field of prosthodontics and cosmetic dentistry, as they underscore the importance of personalization in treatment planning. Understanding patient preferences can lead to improved satisfaction with dental outcomes, fostering a holistic approach that considers not only the functional but also the psychosocial well-being of individuals seeking dental care.

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