



Research article

General dentists' treatment plans in response to cosmetic complains; a field study using unannounced-standardized-patient

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ABSTRACT

Background: This field study explored general dentists' treatment plans in response to the request for cosmetic services of an unannounced standardized patient (USP) in Mashhad, Iran.

Methods: The researcher, as a USP, visited 24 and 23 offices in a high-income and a low-income area, respectively. The primary complaint was that, according to her friend's comments, a dental student, her smile was "crooked and yellow" due to the congenitally missing tooth number 10 and peg-shaped tooth number 8. The dentists' treatment plans for teeth color and form and the cosmetic services expenses were recorded. The treatment plans of the two areas were compared.

Results: For dental form, most dentists' treatment plans were categorized as "No intervention" (privileged area: 37.5 %, less-privileged area: 56.53 %, and total: 46.80 %). The percentage of dentists in the privileged area who prescribed cosmetic services was twice that of the less-privileged area (33.33 % versus 17.39 %). The intervention for dental form varied from placing 1 unit of composite veneer to 10 units of ceramic laminates or orthodontics with a wide range of treatment costs (\$42.09 to \$1079.14). For tooth color, most dentists (privileged area: 62.50 %, less-privileged area: 30.43 %, and total: 46.80 %) were categorized as "Interventionists." For tooth color, the treatment plans varied from scaling and root planing, bleaching, and composite veneer with various costs (\$7.19 to \$197.84).

Conclusion: Cosmetic treatment plans and expenses varied significantly for a single USP, with many not aligning with the standard treatment plan. Some dentists offered treatments even without a chief complaint from the patient. Dentists in privileged areas were twice as likely to prescribe cosmetic treatments compared to those in less privileged areas. Therefore, cosmetic services necessitate monitoring, establishing clear diagnostic criteria, and implementing educational interventions.

1. Introduction

Cosmetic dental services nowadays have become an appealing practice for many dentists and a facial enhancement option for many people [1]. The global market for cosmetic dentistry is expected to expand at a 5 % annual rate, reaching approximately £21 billion by 2026 [2]. These services encompass elective procedures designed to alter orofacial hard and/or soft tissues for aesthetic improvement in the absence of any pathology. Orthodontics, tooth-bleaching, and direct adhesive restorations modify teeth structure, color, and

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position through minimally invasive techniques. Conversely, some interventions, like porcelain laminate veneers, may involve irreversible removal of healthy tooth structure [3]. Such procedures are susceptible to overtreatment, which can negatively impact patients' physical and psychological health, escalating treatment costs and potentially initiating a cycle of restorative treatments [4–6]. However, the extent of overtreatment in cosmetic dental services and the dentists' role in this scenario remains unclear, primarily due to the influence of psychological and socioeconomic factors on the decision to receive these services and the absence of a rigorous methodological approach. Moreover, the subjective nature of beauty perception further complicates the understanding and justification of receiving and providing these services.

Dentists' treatment plans are notably influenced by non-clinical factors such as age, years of experience, and initial training location [7]. Studies indicate that younger dentists and those with substantial loans are more inclined towards aggressive clinical approaches and unnecessary treatments [7,8]. While these findings shed light on factors influencing treatment planning, the decision-making process for cosmetic services requires further investigation. Most research in cosmetic dentistry has relied on questionnaires to gather dentists' perspectives or patients' psychological responses and satisfaction levels [9–12]. However, these studies often face challenges like social desirability bias, which describes the individual's tendency to respond or behave in a way that is favored by society, and the Hawthorne effect, where subjects alter their behavior when they are aware of being observed [8,13,14]. To address these issues, many studies have employed the unannounced standardized patient (USP) method to evaluate clinical performance or educational intervention outcomes. Standardized patients are trained individuals who simulate real patients in clinical or academic settings [14–20]. This method has been used to assess the process quality, communication skills, diagnosis quality, and patient satisfaction for diabetes, depression, back pain, smoking, preventive cancer screening, angina, and hypertension screening [21–25]. USP methodology provides insight into the shortcomings of a healthcare setting and the need for educational interventions, and USPs' feedback has shown clinicians improvements in clinical performance [22,23,25]. The quality of care in dentistry in Iran and other countries is mainly evaluated via real patient satisfaction questionnaires [26,27]. However, the diagnosis process and treatment planning have not been discussed previously in the literature. Therefore, dentistry could benefit from USP methodology to assess the quality of care, diagnosis, and communication skills.

Given the increasing interest in cosmetic dentistry among both dental practitioners and patients, it is essential to examine the quality of real-world practice in providing these services to ensure they are patient-centered and evidence-based. As in other branches of healthcare, oral healthcare should be respectful of and responsive to individual patient preferences, needs, and values, ensuring that patient values guide all clinical decisions [28]. Patient-centered care involves effective communication and shared decision-making [28]. Moreover, implementing evidence-based approaches in healthcare practices reduces healthcare disparities and inequalities, avoids unnecessary treatments, cuts healthcare costs, and maintains patients' physical and mental health [29]. To the best of our knowledge, the present study is the first to approach cosmetic treatment planning among dental practitioners. This qualitative field study in Mashhad, Iran's second-largest city, aimed to investigate 4 main objectives:

- Whether the practitioners thoroughly discuss the need for cosmetic intervention with the patient to see if it is a patient-driven need or if it happened due to criticism from another person and can be resolved by an expert opinion regarding the importance of self-image, or if the practitioners start treatment planning right away by modeling the standard norms and golden ratios.
- If they proposed a treatment plan, would it correspond to the established standard treatment plan (orthodontic treatment)?
- The extent of the treatment plan and associated cost variations among general practitioners in private practices for a single USP.
- The effect of socioeconomic status of the practice region on the treatment plans.

2. Materials and methods

2.1. Study design

The protocol for the present study was approved by the Ethics Committee of North Khorasan University of Medical Sciences (Code: IR.NKUMS.REC.1400.171). To gather treatment plans from general dentists practicing in Mashhad, the researcher (M.H.) visited a

Table 1

The standard treatment plans of specialists.

Treatment plan		Restorative dentistry specialists		Orthodontists
Cosmetic	Shape	Main treatment	Referral to an orthodontist for the possibility of correcting the midline shift, teeth number 5 and 12 rotations, and providing space for placing a dental implant or an acid-etch bridge. Reshaping the peg-shaped tooth number 8 with composite veneer.	Space analysis If possible, midline shift would be corrected and space regained for a dental implant.
		Alternative	Reshaping the peg-shaped tooth number 8	
	Color	Main treatment Alternative	Dental bleaching Composite veneer for a limited number of teeth if whiter teeth were desired.	
Restorative	Must-do		Following up the initial caries lesions of tooth number: 4-5 - 20-21 - 22.	None
	Likely-to-do		Following up the restoration on tooth numbers: 4-14 - 21	

sample of private dental offices in April 2022. This study employed the USP (Unannounced Standardized Patient) approach, where an "actor" is trained to simulate a "real" patient, allowing for the observation and reporting of the practitioner's actual performance. Previous studies have thoroughly detailed the USP methodology [30–33].

2.2. The standard treatment plan

A panel of 11 experts, including Restorative Dentistry and Orthodontics specialists, convened to determine the researcher's restorative and cosmetic treatment needs based on clinical and radiographic examinations. The primary focus of the cosmetic treatment plan was the researcher's midline shift, caused by a congenitally missing tooth number 10 and a peg-shaped tooth number 8. The specialists formulated the cosmetic treatment plan, emphasizing the importance of addressing the patient's self-image and her specific cosmetic concerns (Table 1). It is important to note that no space analysis via study cast preparation or lateral cephalography was conducted. Instead, the treatment plan was derived from clinical and radiographic examinations, including panoramic radiographs (Fig. 1), periapical radiographs, and bitewing radiographs (Fig. 2), to standardize the diagnostic data provided to the specialists and general practitioners. As a result, the standardized treatment plan for teeth requiring extraction was incomplete. However, it was evident that correcting the midline shift would necessitate orthodontic treatment, followed by the placement of either a dental implant or an acid-etch bridge. This treatment plan was used to verify whether general practitioners would seek the correction of the midline shift.

If the patient preferred not to undergo orthodontic treatment, an alternative cosmetic treatment plan was suggested. This plan involved reshaping the peg-shaped lateral tooth. Reshaping the canines to function as lateral teeth was deemed impractical due to the canines' protrusion and the extensive dental tissue removal and reconstruction with composite veneers or laminates that would be required. Consequently, the specialists agreed that the least invasive alternative was reshaping the peg-shaped lateral tooth.

The restorative treatment plan was categorized into "must-do" and "likely-to-do" treatments, based on the urgency of the treatment needs (Table 1). Fig. 3 shows the frontal view of the USP, while Fig. 4 displays the right and left occlusion (Fig. 4(A and B)) and the mandibular and maxillary views (Fig. 4(C and D)) of the USP.

2.3. Dental offices selection

Given the pilot nature of this study and the aim of forming a hypothesis about treatment planning in areas with varying socioeconomic statuses, the study by Yousefi et al. [34], titled "Social Bordering of Urban Spaces in Mashhad: Classifying the Districts based on the Residents' Social Status," was used to select two distinct areas. Sajjad Boulevard was chosen as the privileged area, while Ayatollah Ebadi Boulevard and Khaje Rabi Boulevard were selected as less privileged areas. All private dental offices in both regions were visited using consensus sampling to eliminate selection bias. Additionally, the Mashhad Medical Council obtained a list of general dental practitioners to ensure that the researcher visited all dental offices in these areas.

2.4. Dental office visits

Before the main visits, the researcher conducted pilot visits to five private offices in another privileged area to familiarize herself with the process. During all visits, the researcher presented her initial chief complaint as an annual check-up and provided the dentist with a panoramic radiograph, five periapical radiographs, and two bitewings. Following the examination, the researcher introduced her cosmetic concern by saying, "My friend, who is a dental student and took these radiographs, told me that my smile is crooked and yellow." She then asked for the dentist's opinion. If a treatment plan was proposed, the researcher inquired about alternatives. The quality of the explanations for the treatment plan was assessed based on whether an alternative treatment plan was provided, whether the overall procedures were explained, whether the advantages and disadvantages were discussed and whether referrals to specialists were made. The restorative treatment plan and associated costs were also recorded.

The visits were recorded using the USP's smartphone, with the recordings transcribed into text within 24 h of the interviews. Although obtaining informed consent was not feasible due to the study's objectives and to avoid potential social desirability bias, the study was conducted in accordance with the highest ethical standards. The Ethics Committee Certificate was obtained before the



Fig. 1. The panoramic radiography of the USP.

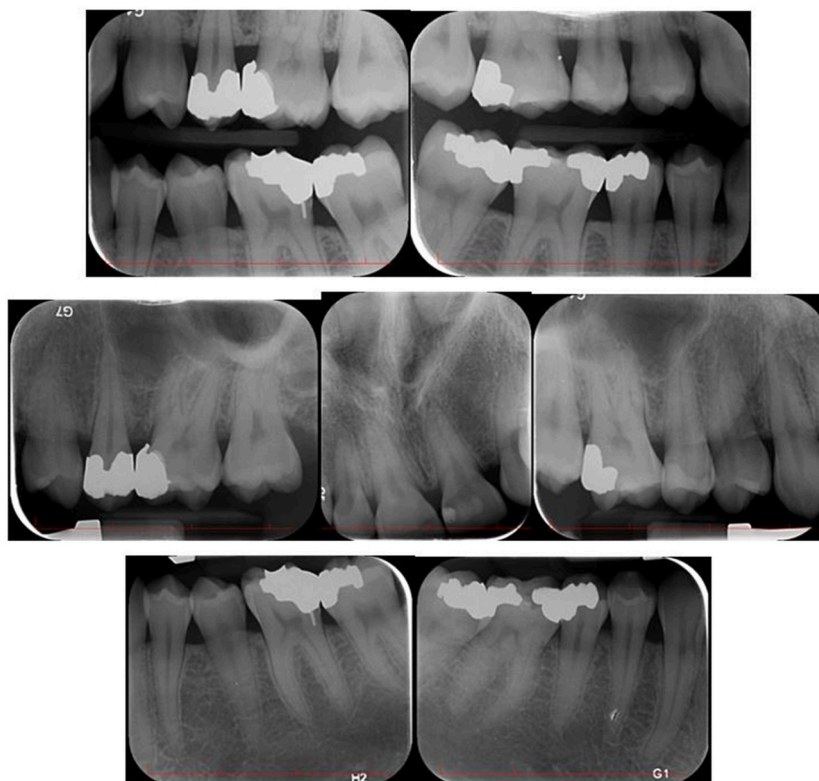


Fig. 2. The preapical and bitewings radiographs of the USP.



Fig. 3. The frontal view of the USP's smile.

research commenced. The researchers ensured the confidentiality of all dentists' identities, with study findings used exclusively for research purposes. Additionally, the recordings were deleted after transcription, and only the researchers had access to the transcripts, ensuring strict privacy and data security for participants.

2.5. Cosmetic treatment plan classification

The proposed treatment plans for the "crooked smile" and "yellow smile" were categorized into three groups:

- 1 Interventionist: Dentists in this group provided a treatment plan before or after the cosmetic request.
- 2 Intervention by request: Dentists in this group allowed the patient to decide on the necessity of treatment.
- 3 No-intervention: Dentists in this group did not recommend a treatment plan.

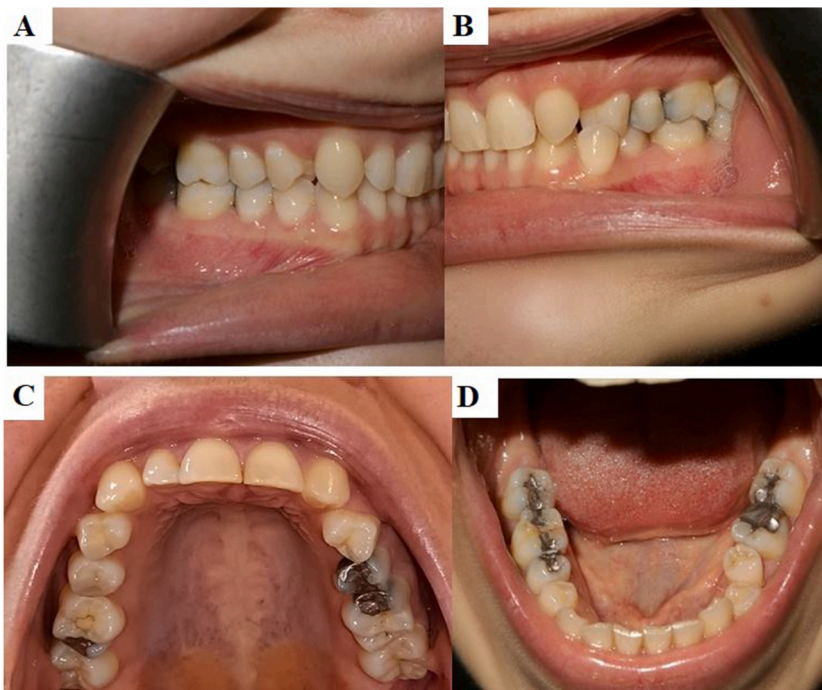


Fig. 4. A and B) Left and right occlusion views and C) and D) maxillary and mandibular views.

2.6. Restorative treatment plans classification

In comparison with the standard treatment plan, including the initial caries follow-up (Table 1), dentists were classified based on the diagnosis of restorative needs:

- 1 Overdiagnosis: Suggesting the restoration of one or more teeth
- 2 Standard: Diagnosing one or more initial caries.
- 3 Underdiagnosis: Failure to diagnose any initial caries.

2.7. Medical council number classification

Dentists' medical council numbers, indicative of their age or years of professional experience, were categorized into four ordinal groups: 1) 0-50k, 2) 50-100k, 3) 100-150k, and 4) 150-200k.

2.8. Data analysis

A mixed-method approach was employed to analyze the data and findings. Two authors (M.H. and A.K.) independently conducted data analysis using Colaizzi's analytic method as follows [35]:

1. Each transcript was read multiple times to ensure a full understanding of its content.
2. Phrases and sentences relevant to the research objective were identified.
3. The meanings of these relevant statements were then formulated.
4. These steps were repeated for each interview, with related meanings categorized into themes.
5. Each theme was then described in detail.
6. A comprehensive description of the phenomenon under study was created, highlighting its essential characteristics.

Colaizzi's analytic method includes a seventh step, "member checking," where key findings are discussed with participants. However, this step was not feasible due to the study's design. To ensure transferability, a detailed description of the findings, along with participant quotes, is provided in the results section.

To compare dentists' gender and medical council numbers in the two regions, and to determine the association between cosmetic treatment plan classification and dentists' office location, medical council number, and gender, Chi-squared and Fisher's exact tests were used. Quantitative data were analyzed using SPSS statistical software version 26.0 (IBM Inc., Chicago, USA), with the significance level set at 0.05.

3. Results

Forty-seven private dental offices were visited, with 24 located in privileged areas and 23 in less-privileged areas. In terms of medical council numbers, in the privileged area, 5 dentists (20.83 %) had numbers between 0 and 50k, 8 dentists (33.33 %) had numbers between 50 and 100k, 9 dentists (37.5 %) had numbers between 100 and 150k, and 2 dentists (8.33 %) had numbers between 150 and 200k. In the less-privileged area, 3 dentists (13.04 %) had medical council numbers between 0 and 50k, 9 dentists (39.13 %) had numbers between 50 and 100k, 6 dentists (26.08 %) had numbers between 100 and 150k, and 5 dentists (21.73 %) had numbers between 150 and 200k. The gender distribution was similar across both areas, with 16 (66.6 %) male dentists in the privileged area and 14 (60.86 %) in the less-privileged area. The comparisons of gender ($p = 0.766$) and medical council numbers ($p = 0.489$) between the areas showed no significant differences. The restorative and cosmetic treatment plans proposed by the dentists were as follows:

3.1. Cosmetic treatment plans

3.1.1. Cosmetic complaint of the "crooked smile"

Dentists' opinions of "crooked smile" comprise a wide range of treatment plans (Table 2). Each group is described in detail below.

Table 2
Dentists' cosmetic treatment plans for the "crooked smile" and "yellow smile".

Chief complaint	Group	Treatment	Area			
			Privileged (N)	Less-privileged (N)		
"crooked smile"	A) Interventionists	Recommending without patient's complaint	Orthodontic treatment	1	0	
			Restorative cosmetic services	4	2	
			Both	1	0	
			Total	6	2	
			Recommending after patient's complaint	Orthodontic treatment	1	1
			Restorative cosmetic services	1	1	
	Total			8 (33.33 %)	4 (17.39 %)	
		B) Intervention by request		Orthodontic treatment	3	2
				Restorative cosmetic services	3	3
				Both	1	1
	Total			7 (29.16 %)	6 (26.08 %)	
		C) No Intervention	Being unrecognizable for lay people		5	2
			Risk of complications		4	3
			Absence of defects in the smile (being un-crooked)		2	5
			The functionality of the current oral status		1	0
	The presence of other factors rather than teeth			2	3	
	The difficulty of the treatment			3	2	
	The possibility of changing one's mind over time			1	0	
	All people have a degree of non-ideal smile line			0	1	
	The uselessness of cosmetic services			0	1	
	The patient's dentist friend should not have pointed out the defect			0	2	
Total			18 (9 dentists (37.5 %))	19 (13 dentists (56.52 %))		
Total "Yellow smile"	A) Interventionist	Recommending without patient's complaint	Dental Bleaching	1	0	
		Recommending intervention after patient's complaint	Dental Bleaching	13	4	
			SRP	3	1	
			Composite veneers laminate	0	1	
			Not explaining the treatment	0	1	
	Total			17 (15 dentists (62.5 %))	7 (30.43 %)	
		B) Intervention by request		Bleaching	3	3
				Composite veneers laminate	0	1
	Total			3 (12.5 %)	4 (17.39 %)	
		C) No intervention	Tooth color was natural and typical for Iranian teeth color		6	11
			The possibility of complications		1	3
			Positive feedback on teeth color		0	1
			Dental anomalies become evident in white teeth		0	1
	Total			7 (6 dentists (25 %))	16 (12 dentists (52.15 %))	
	Total			24 (100 %)	23 (100 %)	

A) Interventionists

A.1) Recommending cosmetic services without patients' complaint

In the privileged area, six dentists, and in the less-privileged area, two dentists suggested cosmetic treatments even before the USP expressed any cosmetic concerns. They mainly focused on the missing tooth #10 that has "impaired" the patient's facial appearance and "fixing" it to make it "more pretty." A dentist said: "Let me say one point; you know you don't have one tooth. There are several options for fixing it, like orthodontic treatment." When the USP asked whether she recommended doing anything, she said: "I'm a dentist; you can't ask me that because when you start talking, I see your teeth. In my opinion, it is ugly, to be honest!"

In another office, the dentist pointed out: "And you miss one tooth here, and well, it has ruined your appearance. If you want to make the anterior part of your mouth beautiful, we may blunt this canine, form this little lateral, and close the spaces. Smile. Now see your smile, isn't it beautiful? Cosmetics can fix it." Then the dentist told her story of getting 10 units of ceramic laminates because her husband and her surroundings had told her, "Why do your teeth look yellow? Aren't you a dentist?" she told the researcher: "After 2–3 days, you'll get used to the composites. You'll smile in some pictures and see how beautiful you've become. Putting up some lipsticks. When I smile in the photos, my teeth look white. In the past, I didn't dare to smile a lot because my teeth were yellow and looked bad in the photos."

Another dentist commented that the researcher's peg-shaped laterals and sharp canines were "disharmonious" with her personality and style. Then, without further explanation, he added some composites on the researcher's peg-shaped lateral: "You see how different your face has become? Your smile décor would change a lot. I didn't like that tooth at all; that wasn't you." He also recommended the orthodontic treatment, but in his opinion, the cosmetic treatment was "less expansive, less strategic, less tragic and needed less time, money and everything."

Another dentist offered a treatment plan consisting of 2–10 units of maxillary anterior composite veneers that looked "more natural" or 6–10 units of ceramic laminate veneers that looked "the most beautiful." After diagnosing the gingival and bone recession, another dentist said, "Your teeth are small. Small teeth are like nails and scalpels, and that causes it (the gingival recession), too. If you fix it, it will look much better."

A.2) Recommending cosmetic services following the patient's complaint

Four dentists recommended orthodontic treatment in response to the researcher's complaint. One dentist recommended rhinoplasty and orthodontics, and another compared tooth loss to finger loss: "It's like not having one finger; it's a bit weird."

B) Intervention by request

Thirteen dentists explained the etiology of the "crooked smile" after hearing the USP's chief complaint. They described treatment options but said it was the patient's choice to "straighten her midline." A dentist said: "You just said your friend said (that your smile is crooked). See, patients' treatments are patients' calls. One cares about it, and one may not even notice it. The standard status is this (pointing to the dental model on his desk)." Seven dentists mentioned the complications of these interventions and recommended that "the fewer treatments, the better."

C) No-intervention

Twenty-two dentists did not offer any treatment plans, citing nine different reasons. The most common reasons included: 1) the issue was not apparent to anyone other than the dentist, 2) cosmetic services were deemed to have dental complications, be time-consuming, and expensive, and 3) the USP's smile was considered flawless.

3.1.2. Cosmetic complaint about the "yellow smile"

Table 2 presents the dentists' responses to the "yellow smile" complaint. Each group's recommendations are detailed below.

A) Interventionists

Twenty-two dentists recommended one or two whitening treatments to improve the smile's appearance. Teeth bleaching was the most frequently suggested service, recommended by 17 dentists. Ten dentists explained the procedure in detail, and 8 dentists warned about potential dentin hypersensitivity following office bleaching. These dentists recommended home whitening methods because of their durability and lower cost. Five dentists suggested both office and home whitening techniques. Three dentists assured that dental bleaching was completely safe. They noted that tooth discoloration could result from excessive coffee and tea consumption, smoking, genetics, race, or contrast with lighter skin tones. Three dentists assessed the researcher's teeth as shade A2 using VITA shade guides, predicting that bleaching would achieve shade A1.

B) Intervention by request

Seven dentists noted that personal taste and sensitivity influence perceptions of tooth color. Among the most recommended whitening treatments, one suggested composite veneers due to "teeth wear following abrasive toothpaste." One dentist criticized

the "imaginary" friend's opinion on the tooth color, stating, "The natural color of the dentin is yellow, and your teeth color is A2, which is the teeth color of 90 % of people. It's not ugly; it's natural. But there are options for people who like white teeth."

C) No intervention

Eighteen dentists did not provide any treatment plans for various reasons. The most common reason was the belief that the researcher's teeth color was natural. Some dentists opposed whitening techniques due to concerns about the high caries risk associated with composite veneers or the hypersensitivity risk of bleaching.

3.2. The treatment planning quality

Table 3 outlines the variables influencing the quality of treatment plans. Nearly half of the dental visits (48.93 %) lasted between 5 and 10 min. Most dentists offered a single treatment option for smile form (68 %) and color (86.20 %). Among the 29 dentists in the intervention and intermediate groups, a majority described the overall procedure for the cosmetic service (93.13 %) and discussed both the advantages and potential disadvantages of the proposed treatments (58.62 %). Additionally, more than half of the dentists (56 %) referred patients for cosmetic services.

3.3. Dentists' office area and treatment planning

Table 4 illustrates the distribution of cosmetic treatment plans among dentists in privileged and less-privileged areas. Regarding the "crooked smile," six dentists in the privileged area and two in the less-privileged area recommended treatments without any complaint from the Unannounced Standardized Patient (USP). In the privileged area, 33.33 % of dentists were classified as Interventionists, compared to 17.39 % in the less-privileged area. The proportion of dentists classified as "Intervention by request" was similar across both groups, with approximately 29.16 % in the privileged area and 26.08 % in the less-privileged area. Conversely, the "No intervention" category had a higher proportion of dentists in the less-privileged area (56.52 %) compared to the privileged area (37.5 %). Similar trends were observed for the "crooked smile" scenario, with the privileged area having nearly double the proportion of Interventionists (62.5 % versus 30.43 %) and half the proportion of No-intervention dentists (25 % versus 52.15 %). One dentist in the privileged area recommended dental bleaching without any complaint from the USP. The Chi-squared test did not show a significant difference between the areas.

3.4. Restorative treatment plans

- Undertreatment: Twenty-five dentists (11 from the privileged area – 15 from less privileged areas) diagnosed no caries
- Standard treatment plans: Fifteen dentists (6 from the privileged area and 9 from the less-privileged areas) identified one or more initial caries and recommended careful oral hygiene. Two dentists addressed all initial caries.
- Overtreatment: Seven dentists, who all practiced in the privileged area, suggested 1 to 5 restorations.

Table 3
Quality of the treatment planning.

	Variables	Items	N (%)	
1	Examination duration	Less than 5 min	16 (34.04)	
		5–10 min	23 (48.93)	
		More than 10 min	8 (17.02)	
		Total	47 (100)	
2	Certainty in the treatment plans	"Crooked smile"	One treatment plan	17 (68)
			Alternative	8 (32)
		Total	25 (100)	
		"Yellow smile"	One treatment plan	25 (86.20)
	Alternative		4 (13.79)	
		Total	29 (100)	
3	Describing the overall procedure (both form and color)	Yes	27 (93.13)	
		No	2 (6.89)	
		Total	29 (100)	
4	Explaining advantages and disadvantages	Yes	17 (58.62)	
		No	12 (41.37)	
		Total	29 (100)	
5	Referral for the "crooked smile"	Orthodontist	13 (52)	
		Prosthodontist	1 (4)	
		No referrals	11 (44)	
		Total	25	

Table 4
Distribution of treatment plans based on the dentists' medical council number, gender, and their office area.

Treatment plans	Groups	Medical council number						Area			Gender		
		0-50 k	50-100 k	100-150 k	150-200 k	Total	P value	Privileged	Less privileged	P value	Male	Female	P value
"crooked smile"		2	1	7	0	10	0.027 ^a	7	3	0.148	5	5	0.432
	A) Interventionists	2	4	5	4	15		9	6		9	6	
	B) Intervention by request	4	12	3	3	22		8	14		16	6	
	C) No intervention Total	8	17	15	7	47		24	23		30	17	
"Yellow teeth"		5	3	10	2	20	0.001 ^a	14	6	0.080	10	10	0.120
	A) Interventionists	0	2	4	4	10		4	6		6	4	
	B) Intervention by request	3	12	1	1	17		6	11		14	3	
	C) No intervention Total	9	17	15	7	47		24	23		30	17	

^a *p* value less than 0.05 considered as statistically significant according to the Fisher' exact test.

3.5. Dentists' medical council number and gender relationship with treatment planning

Table 4 displays the distribution of treatment plans based on the dentists' medical council numbers. A significant association was found between the number and cosmetic treatment plan classifications ($p < 0.05$). Most dentists in the No-intervention group for both form and color had medical council numbers between 100 and 150k, whereas dentists in the Intervention group predominantly had numbers ranging from 150 to 200k. Dentists' gender did not significantly influence their treatment plans regarding dental shape ($p = 0.432$) or color ($p = 0.120$).

3.6. Treatment costs

Table 5 outlines the treatment costs for the researcher. Of the 47 dentists, 28 (59.75 %) charged the standard visit fee. Four dentists charged more, while 24 dentists charged less than \$1.80, which was the dental visit tariff in Iran for 2021–2022, with the exchange rate at 278,000 Iranian Rials per US dollar in April 2022.

Eleven dentists prescribed composite laminates, with an average cost of $\$45.68 \pm \8.63 per unit. Composite veneers ranged from \$43.17 to \$388.49 for 1–12 units. Three dentists recommended 8 to 20 porcelain veneer units, with costs ranging from \$287.77 to \$719.42. The average cost for each porcelain veneer was $\$719.42 \pm \17.99 .

4. Discussion

In this study, 47 dentists offered a wide range of cosmetic services at varying costs in response to a single patient's chief complaint in a real-world setting. Of the 25 dentists in the intervention group for the "crooked smile," only 11 recommended orthodontic treatment, which was the standard treatment according to the expert panel's suggested plan for the researcher M.H. The remaining intervening dentists suggested one to eight units of composite or ceramic veneers, which could be considered overtreatment when compared to the standard treatment plan. Dentists cited the benefits of composite veneers—such as aesthetics, affordability, replaceability, and the lack of need for tooth preparation—while only one dentist mentioned the requirement to remove tooth structure for ceramic veneers. While most dentists recommended teeth whitening through bleaching, some also proposed alternatives like composite veneers and scaling. In a few cases, dentists explained the potential adverse effects of dental bleaching, but the majority presented it as a completely safe procedure. Overall, while most dentists outlined the general cosmetic procedures, 41 % did not mention the potential risks associated with the treatments offered.

To our knowledge, this pilot study is the first to use the USP method to examine the cosmetic treatment plans of general dentists. The USP methodology is an approach grounded in ethnographic and observational research principles. By placing standardized patients in real healthcare environments, this method aims to observe genuine and unaltered interactions between healthcare providers and patients, ensuring ecological validity. Furthermore, grounded theory was employed to develop theoretical constructs directly from the data gathered through USP observations [36]. The USP method effectively eliminates social desirability bias and the Hawthorne effect, which are common issues in methods such as direct observation and patient/healthcare worker exit interviews used to assess healthcare workers' self-reported clinical behavior. This method has been widely utilized in evaluating primary healthcare quality and medical education [22,37].

While the prevailing view is that the ethical justification for cosmetic services is often "patient-driven" [38–40], this study revealed that 8 out of 47 dentists proposed cosmetic services without the researcher presenting any cosmetic complaint, indicating a "Dentist-driven" approach. Doughty et al. [41] described marketing strategies in the literature that dental professionals use to increase patient uptake of cosmetic dental procedures. Among these strategies, "educating patients on the benefits of cosmetic dentistry" and "conducting cosmetic dental examinations" were observed among the study participants who provided Dentist-driven treatment plans. Other strategies included offering financing options, providing the dental team with 'smile-makeovers,' enhancing the practice décor, and offering discounted teeth whitening [41]. A key characteristic of cosmetic surgery is that it is typically initiated by the consumer to improve their appearance and self-esteem [38]. Emrani [42] examined the socioeconomic factors influencing the demand for cosmetic dental treatments among 498 participants in Tehran, Iran, finding that younger age and female gender were significantly associated with receiving these treatments, a trend also reported by other authors in various countries [43,44]. Furthermore, nearly 65 % of this population was unemployed, with treatment costs covered by their parents [42]. Consequently, Dentist-driven treatment plans may undermine patients' self-esteem and increase the pressure to engage in bodywork. This could also lead to increased patient debt and financial strain to afford cosmetic services. Additionally, it may result in a rise in orthodontic treatments motivated purely by aesthetic

Table 5
Treatment costs (\$).

Item	Number of dentists	Minimum	Maximum	Mean \pm SD
One-unit composite laminate veneers	11	32.37	64.75	45.68 \pm 8.63
One-unit porcelain veneer	3	53.96	89.93	71.94 \pm 17.99
Bleaching	24	46.76	197.84	101.44 \pm 28.78
SRP	4	7.19	17.99	11.51 \pm 5.40
Restoration	7	17.99	143.88	62.23 \pm 47.84
Visit fee	47	0	31.65	9.14 \pm 8.71

outcomes, potentially leading to higher healthcare costs [45] and diverting funds away from addressing essential health-related issues [46].

Several factors may contribute to Dentist-driven treatment plans, including financial incentives, dentists' perfectionism, marketing their services as "smile makeovers," and considering patients' ability to pay, or a combination of these elements. Notably, six of the eight dentists practicing this approach were located in privileged regions. In areas with a high concentration of dentists, such as these privileged regions, there may be a competitive environment where dentists are motivated to maximize profits. Ghoneim et al. [8] suggested that factors like perceived high-practice loans, low patient volume, and younger age are strongly associated with more aggressive and costly treatment plans. Similarly, in the present study, younger dentists—indicated by higher medical council numbers—were more likely to recommend interventions than their older counterparts. Furthermore, the Interventionist group included more dentists from privileged regions, while nearly half of the dentists from less privileged regions fell into the No-intervention category. Additionally, all restorative treatments in our study were prescribed by dentists practicing in privileged areas, potentially underscoring the influence of financial incentives on decision-making.

Kiadaliri et al. [47] found that a high density of dentists is strongly correlated with the higher social rank of an area. The uneven distribution of dentists is a common healthcare issue in many countries, including Iran [48]. This concern becomes more significant when considering that, despite the increasing number of dentists in Iran [48], the mean decayed-missing-filled teeth index (DMFT), decayed teeth (DT), and missing teeth (MT) rose by nearly 58.0 %, 84.5 %, and 31.6 % respectively, from 1990 to 2017(49). Although the number of filled teeth (FT) increased 2.6-fold during the same period, the proportion of DT and FT also continuously increased [49]. Consequently, this uneven distribution of dentists and the varying treatment plans and costs across regions may result in patients in privileged areas receiving excessive treatment while those in less-privileged areas face limited access to dental services. The social contract within the healthcare system strongly emphasizes fairness in the distribution of health services, and healthcare professionals are ethically obligated to practice in a manner that enhances access to healthcare resources [50]. Moeller and Quiñonez [51] have also warned that the social contract in dentistry is at risk due to the profession's passive stance on critical issues like access to dental care and its disregard for social determinants of health.

Building on the earlier discussion, dentists' perfectionism may play a significant role in their cosmetic treatment planning, leading to "Dentist-driven" treatments. Many dentists consider objective measures and ideal dental and gingival indexes as key indicators of beauty [52–56]. Additionally, dentists often perceive higher cosmetic needs than patients themselves [57–60]. As a result, exaggerating dental "imperfections" and recommending unnecessary cosmetic services based on financial interests or personal preferences is unethical [61–63]. This approach can manipulate patients' self-esteem, a strong predictor for pursuing cosmetic treatments [38, 64–68]. Our study also identified a possible link between dentists' medical council numbers and their propensity to propose cosmetic treatments, with more experienced dentists tending to suggest fewer interventions. Consistent with this finding, previous studies have shown that older dentists are generally more conservative than their younger counterparts [7,8,69]. Some researchers suggest that senior dentists may be more ethical and less swayed by financial incentives when prescribing treatments [70]. Ghoneim et al. [8] also found that factors like initial training location and years of clinical experience significantly influence dental treatment planning. However, due to the study's design, we could not examine some of the potentially influential factors, including any additional courses taken.

An intriguing finding of this study was the wide variation in fees for the proposed cosmetic treatment plans, ranging from \$42.09 for a single composite veneer unit to \$1079.14 for ten ceramic laminate units. Several factors, including age, knowledge, initial training, and experience, can influence a clinician's decision-making process [8,71]. However, given that the motivations for cosmetic treatments are often subjective, it is crucial to consider the patient's needs and psychological factors when explaining the advantages and disadvantages of available treatments [72–74]. In this study, about a quarter of the dentists recommended orthodontic treatment and provided thorough explanations. However, a significant number suggested more aggressive and expensive cosmetic services that were questionable. Additionally, some clinicians may struggle to distinguish between a patient's genuine request and a self-image that has been influenced by social media or others, such as the researcher's imaginary dentist friend in the study scenario. Only two dentists criticized the friend's comments about the patient's smile. Upon receiving a patient's cosmetic request, some dentists immediately offered alternative treatment plans, while others left the decision up to the patient. This highlights the potential need for integrating evidence-based, patient-centered aesthetic courses into dental education.

This study had several limitations, and its findings should be interpreted with caution. The data analysis is indicative rather than conclusive, mainly due to the relatively small sample size and the qualitative nature of the data, which precludes statistically significant associations. Additionally, the study only assessed private dental offices, excluding public clinics. In the less-privileged region, where the number of offices was limited, the research area was expanded. Despite these constraints, a diverse sample was obtained from two distinct socioeconomic areas in Mashhad. However, due to the pilot nature of the study, the selected dental offices may not be fully representative of general practices in Mashhad. The aim was to choose two contrasting areas within the city to enhance the diversity of the encounters.

Another limitation is that the cosmetic treatment plans might have been influenced by the researcher's gender and age. Since the study focused on private offices in Mashhad, Iran, and a unique scenario, generalizing the findings to other contexts, practice settings, and cultures should be done with care. However, the scenario involved an objective issue—a midline shift and peg-shaped lateral teeth—with the recommended treatment being orthodontic correction if the patient wished to address the midline shift. According to a recent study by Najarzadegan and Eslamipour [75], the perceptions of 100 Americans and 100 Iranians regarding smile aesthetics were compared, revealing no significant differences between the groups in their acceptance thresholds and preferences for the most attractive smile, except for the buccal corridor. Similarly, a study by Sadrhaghghi et al. [76] investigated the acceptability thresholds for smile variations among laypersons in nine cities worldwide. They found that the acceptability threshold for midline deviation

varied slightly between cities but was generally consistent, indicating that midline alignment is an important component of smile aesthetics globally. Given the increasing time people spend on image-focused social media platforms like Instagram, Snapchat, and TikTok, it's likely that younger individuals worldwide may share a common perception of the "ideal" smile, often referred to as the "Hollywood smile"—a white, symmetrical, and consonant smile arc. This underscores the importance of considering both subjective and objective elements in clinical scenarios, as different situations may yield varying outcomes.

Another limitation was the lack of existing literature on using Unannounced Standardized Patients (USPs) in assessing the quality of care and treatment planning in dentistry, limiting the ability to compare results. Previous studies on dental care quality have typically used questionnaires to assess patient satisfaction or dentists' self-reported practices [27]. Furthermore, no prior research has examined dentists' behavior in cosmetic dentistry. This highlights the need to design a checklist to investigate the quality of care and diagnosis in dentistry, as well as to conduct quantitative studies.

The absence of consensus on treatment options and costs in this study suggests a lack of strict guidelines for providing cosmetic dental services, leading to treatment planning that largely depends on individual professional judgment. Therefore, there is a need for practical education programs, the establishment of standard guidelines, and monitoring measures. It's important to recognize that, when provided ethically and professionally to the right patient at the right time, cosmetic services can have a positive impact on people's lives.

5. Conclusions

Dentists' proposed treatment plans and associated costs for a single patient exhibited significant variability. The most frequently recommended options included restorative cosmetic procedures and dental bleaching. Notably, in more privileged areas, dentists were more inclined to suggest treatment plans without the patient initiating a cosmetic complaint, while a greater number of dentists in less privileged areas refrained from the intervention. The recommended treatments often deviated from the standard treatment plan, emphasizing the importance of monitoring cosmetic service provision by general dentists, particularly in privileged areas. Furthermore, developing diagnostic and cosmetic treatment plan guidelines is recommended.

Data and code availability

The data that has been used is confidential.

CRedit authorship contribution statement

Melika Hoseinzadeh: Writing – original draft, Methodology, Investigation, Formal analysis, Data curation. **Afsoon Motallebi:** Writing – review & editing, Validation, Supervision, Project administration, Conceptualization. **Ali Kazemian:** Writing – review & editing, Validation, Supervision, Project administration, Methodology, Formal analysis, Conceptualization.

Declaration of competing interest

The authors declare that they have no known competing financial interests or personal relationships that could have appeared to influence the work reported in this paper.

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References

- [1] A.C.L. Holden, Consumed by prestige: the mouth, consumerism and the dental profession, *Med. Healthc. Philos.* 23 (2) (2020) 261–268, <https://doi.org/10.1007/s11019-019-09924-4>.
- [2] J.V. Welie, Is dentistry a profession? Part 3. Future challenges, *J. Can. Dent. Assoc.* 70 (10) (2004) 675–678.
- [3] R. Hirata, et al., Quo vadis, esthetic dentistry? Ceramic veneers and overtreatment—a cautionary tale, *J. Esthetic Restor. Dent.* 34 (1) (2022) 7–14.
- [4] R.E. Goldstein, Attitudes and problems faced by both patients and dentists in esthetic dentistry today: an AAED membership survey, *J. Esthetic Restor. Dent.* 19 (3) (2007) 164–170.
- [5] S. Brownlee, et al., Evidence for overuse of medical services around the world, *Lancet* 390 (10090) (2017) 156–168.
- [6] A. Kazemian, et al., How much dentists are ethically concerned about overtreatment; a vignette-based survey in Switzerland, *BMC Med. Ethics* 16 (2015) 43, <https://doi.org/10.1186/s12910-015-0036-6>.
- [7] D. Grembowski, L. Fiset, P. Milgrom, K. Forrester, A. Spadafora, Factors influencing the appropriateness of restorative dental treatment: an epidemiologic perspective, *J. Publ. Health Dent.* 57 (1) (1997) 19–30, <https://doi.org/10.1111/j.1752-7325.1997.tb02469.x>.
- [8] A. Ghoneim, et al., What influences the clinical decision-making of dentists? A cross-sectional study, *PLoS One* 15 (6) (2020) e0233652, <https://doi.org/10.1371/journal.pone.0233652>.
- [9] M. Frazer, S. Lindsay, Development of a questionnaire to measure concern for dental appearance, *Psychol. Rep.* 89 (2) (2001) 425–430, <https://doi.org/10.2466/pr0.2001.89.2.425>.
- [10] R.J. Honigman, A.C. Jackson, N.A. Dowling, The PreFACE, A preoperative psychosocial screen for elective facial cosmetic surgery and cosmetic dentistry patients, *Ann. Plast. Surg.* 66 (1) (2011) 16–23, <https://doi.org/10.1097/SAP.0b013e3181d50e54>.

- [11] D. Shetty, S. Bhat, Recognition of oral and maxillofacial surgeons by dental professionals and their perceptions regarding cosmetic facial surgery-A questionnaire-based study, *J. Oral Maxillofac. Surg.* 77 (12) (2019) 2556, <https://doi.org/10.1016/j.joms.2019.08.008>, e1-e7.
- [12] A.M. Lama, M.A. Alrafee, White teeth fever: dentist perception and attitude in Riyadh, Saudi Arabia, *Ann. Dent. Spec.* 8 (3) (2020) 67.
- [13] S.E. Park, N.K. Anderson, N.Y. Karimbux, OSCE and case presentations as active assessments of dental student performance, *J. Dent. Educ.* 80 (3) (2016) 334–338.
- [14] S. Zabar, et al., Unannounced standardized patients: a promising method of assessing patient-centered care in your health care system, *BMC Health Serv. Res.* 14 (2014) 157, <https://doi.org/10.1186/1472-6963-14-157>.
- [15] L. Howley, K. Szauder, L. Perkowski, M. Clifton, N. Mcnaughton, Quality of standardised patient research reports in the medical education literature: review and recommendations, *Med. Educ.* 42 (4) (2008) 350–358, <https://doi.org/10.1111/j.1365-2923.2007.02999.x>.
- [16] A.E. Cortés-Rodríguez, et al., Role-play versus standardised patient simulation for teaching interprofessional communication in care of the elderly for nursing students, *Healthcare (Basel)* 10 (1) (2021), <https://doi.org/10.3390/healthcare10010046>.
- [17] B. Daniels, et al., Tuberculosis diagnosis and management in the public versus private sector: a standardised patients study in Mumbai, India, *BMJ Glob. Health* 7 (10) (2022), <https://doi.org/10.1136/bmjgh-2022-009657>.
- [18] S. Escribano, et al., Efficacy of a standardised patient simulation programme for chronicity and end-of-life care training in undergraduate nursing students, *Int. J. Environ. Res. Publ. Health* 18 (21) (2021), <https://doi.org/10.3390/ijerph18211673>.
- [19] P. Diz Dios, et al., "Scheduling delay" in oral cancer diagnosis: a new protagonist, *Oral Oncol.* 41 (2) (2005) 142–146, <https://doi.org/10.1016/j.oraloncology.2004.07.008>.
- [20] D.M. Hompashe, U.G. Gerdtham, C.S. Christian, A. Smith, R. Burger, 'The nurse did not even greet me': how informed versus non-informed patients evaluate health systems responsiveness in South Africa, *BMJ Glob. Health* 6 (4) (2021), <https://doi.org/10.1136/bmjgh-2020-004360>.
- [21] Y. Wu, et al., Process quality, diagnosis quality, and patient satisfaction of primary care in Rural Western China: a study using standardized patients, *Patient Educ. Counsel.* 123 (2024) 108208, <https://doi.org/10.1016/j.pec.2024.108208>.
- [22] A. Schwartz, S. Peskin, A. Spiro, S.J. Weiner, Direct observation of depression screening: identifying diagnostic error and improving accuracy through unannounced standardized patients, *Diagnosis* 7 (3) (2020) 251–256, <https://doi.org/10.1515/dx-2019-0110>.
- [23] A. Schwartz, S. Peskin, A. Spiro, S.J. Weiner, Impact of unannounced standardized patient audit and feedback on care, documentation, and costs: an experiment and claims analysis, *J. Gen. Intern. Med.* 36 (1) (2021) 27–34, <https://doi.org/10.1007/s11606-020-05965-1>.
- [24] Z. Phillips, et al., Using unannounced standardized patients to assess clinician telehealth and communication skills at an urban student health center, *J. Adolesc. Health* 74 (5) (2024) 1033–1038, <https://doi.org/10.1016/j.jadohealth.2024.01.014>.
- [25] L. Zhang, et al., Quality in screening and measuring blood pressure in China's primary health care: a national cross-sectional study using unannounced standardized patients, *Lancet Reg Health West Pac* 43 (2024) 100973, <https://doi.org/10.1016/j.lanwpc.2023.100973>.
- [26] F. Eslamipour, B. Tahani, K. Heydari, H. Salehi, Dental care satisfaction among adult population in Isfahan, Iran and its influencing factors, *JOHOE* 6 (4) (2017) 218–225.
- [27] M.J. Byrne, et al., A systematic review of quality measures used in primary care dentistry, *Int. Dent. J.* 69 (4) (2019) 252–264, <https://doi.org/10.1111/idj.12453>.
- [28] S. Scambler, M. Delgado, K. Asimakopoulou, Defining patient-centred care in dentistry? A systematic review of the dental literature, *Br. Dent. J.* 221 (8) (2016) 477–484, <https://doi.org/10.1038/sj.bdj.2016.777>.
- [29] J. Eslava-Schmalbach, et al., Considering health equity when moving from evidence-based guideline recommendations to implementation: a case study from an upper-middle income country on the GRADE approach, *Health Pol. Plann.* 32 (10) (2017) 1484–1490, <https://doi.org/10.1093/heapol/czx126>.
- [30] B. Daniels, et al., Use of standardised patients to assess quality of healthcare in Nairobi, Kenya: a pilot, cross-sectional study with international comparisons, *BMJ Glob. Health* 2 (2) (2017) e000333, <https://doi.org/10.1136/bmjgh-2017-000333>.
- [31] V. Das, et al., Simulated patients and their reality: an inquiry into theory and method, *Soc. Sci. Med.* 300 (2022) 114571, <https://doi.org/10.1016/j.socscimed.2021.114571>.
- [32] A. Kwan, et al., Variations in the quality of tuberculosis care in urban India: a cross-sectional, standardized patient study in two cities, *PLoS Med.* 15 (9) (2018) e1002653, <https://doi.org/10.1371/journal.pmed.1002653>.
- [33] S. Sylvia, et al., Survey using incognito standardized patients shows poor quality care in China's rural clinics, *Health Pol. Plann.* 30 (3) (2015) 322–333, <https://doi.org/10.1093/heapol/czu014>.
- [34] A. Yousefi, On social bordering of urban spaces in Mashhad: classifying the Districts based on the Residents' social status, *J. Soc. Sci.* 2 (2010).
- [35] L. Wirihana, et al., Using Colaizzi's method of data analysis to explore the experiences of nurse academics teaching on satellite campuses, *Nurse Res.* 25 (4) (2018) 30, <https://doi.org/10.7748/nr.2018.e1516>.
- [36] B. Ghorbani, A.C. Jackson, N. Dehghan-Nayeri, F. Bahramnezhad, Standardized patients' experience of participating in medical students' education: a qualitative content analysis, *BMC Med. Educ.* 24 (1) (2024) 586, <https://doi.org/10.1186/s12909-024-05531-x>.
- [37] S.J. Weiner, S. Wang, B. Kelly, G. Sharma, A. Schwartz, How accurate is the medical record? A comparison of the physician's note with a concealed audio recording in unannounced standardized patient encounters, *J. Am. Med. Inf. Assoc.* 27 (5) (2020) 770–775, <https://doi.org/10.1093/jamia/ocaa027>.
- [38] A.C. Holden, Cosmetic dentistry: a socioethical evaluation, *Bioethics* 32 (9) (2018) 602–610, <https://doi.org/10.1111/bioe.12498>.
- [39] T.M. Mtolo, P.D. Motloba, Grillz and gold teeth-esthetic, economics and Ethics, *SADJ* 76 (8) (2021) 498–500.
- [40] D. Majumder, et al., Recommended clinical practice guidelines of aesthetic dentistry for Indians: an expert consensus, *J. Conserv. Dent. : J. Comput. Dynam.* 25 (2) (2022) 110–121, https://doi.org/10.4103/jcd.jcd_32_22.
- [41] J. Doughty, R. Lala, Z. Marshman, The dental public health implications of cosmetic dentistry: a scoping review of the literature, *Community Dent. Health* 33 (3) (2016) 218–224.
- [42] R. Emrani, Socioeconomic determinants of demand for dental cosmetic treatments, *Indian J. Dent. Res.* 34 (1) (2023) 36–39, https://doi.org/10.4103/ijdr.ijdr_390_22.
- [43] L.A. Campos, Campos Jadb, J. Marôco, T. Peltomäki, Aesthetic dental treatment, orofacial appearance, and life satisfaction of Finnish and Brazilian adults, *PLoS One* 18 (6) (2023) e0287235.
- [44] M.M. Tin-Oo, N. Saddki, N. Hassan, Factors influencing patient satisfaction with dental appearance and treatments they desire to improve aesthetics, *BMC Oral Health* 11 (1) (2011) 6, <https://doi.org/10.1186/1472-6831-11-6>.
- [45] M. Hung, et al., Examination of orthodontic expenditures and trends in the United States from 1996 to 2016: disparities across demographics and insurance payers, *BMC Oral Health* 21 (1) (2021) 268, <https://doi.org/10.1186/s12903-021-01629-6>.
- [46] M. Arab-Zozani, M.Z. Pezeshki, R. Khodayari-Zarnaq, A. Janati, Medical overuse in the Iranian healthcare system: a systematic review protocol, *BMJ Open* 8 (4) (2018) e020355, <https://doi.org/10.1136/bmjopen-2017-020355>.
- [47] A.A. Kiadaliri, R. Hosseinipour, H. Haghparast-Bidgoli, U.-G. Gerdtham, Pure and social disparities in distribution of dentists: a cross-sectional province-based study in Iran, *Int. J. Environ. Res. Publ. Health* 10 (5) (2013) 1882–1894, <https://doi.org/10.3390/ijerph10051882>.
- [48] M. Afshari, A.A. Haghdooost, B. Houshmand, M. Dehghani, S. Amanpour, Dentist to population ratio and geographic distribution of dentists in Iran in 2019, *J. Oral Health Oral Epidemiol* 10 (2) (2021) 72–80, <https://doi.org/10.20122/johoe.v10i2.1159>.
- [49] S. Shoaee, et al., National and subnational trend of dental caries of permanent teeth in Iran, 1990–2017, *Int. Dent. J.* (2023), <https://doi.org/10.1016/j.identj.2023.07.012>.
- [50] R.M. Veatch, Justice, the basic social contract and health care. *Cont Iss Bioethic*, 1999.
- [51] J. Moeller, C.R. Quiñonez, Dentistry's social contract is at risk, *J. Am. Dent. Assoc.* 151 (5) (2020) 334–339.
- [52] E.P. Allen, Use of mucogingival surgical procedures to enhance esthetics, *Dent. Clin.* 32 (2) (1988) 307–330, [https://doi.org/10.1016/S0011-8532\(22\)00342-1](https://doi.org/10.1016/S0011-8532(22)00342-1).
- [53] J.D. Sterrett, et al., Width/length ratios of normal clinical crowns of the maxillary anterior dentition in man, *J. Clin. Periodontol.* 26 (3) (1999) 153–157, <https://doi.org/10.1034/j.1600-051x.1999.260304.x>.

- [54] S. Wolfart, et al., Subjective and objective perception of upper incisors, *J. Oral Rehabil.* 33 (7) (2006) 489–495, <https://doi.org/10.1111/j.1365-2842.2005.01581.x>.
- [55] S. Wolfart, H. Thormann, S. Freitag, M. Kern, Assessment of dental appearance following changes in incisor proportions, *Eur. J. Oral Sci.* 113 (2) (2005) 159–165.
- [56] P. Magne, Belser U. *Natural Oral Esthetics* 2002. vols. 57–96 p.
- [57] C. Mehl, et al., Influence of dental education on esthetic perception, *Int J Esth Dent* 10 (3) (2015).
- [58] D. Tortopidis, A. Hatzikyriakos, M. Kokoti, G. Menexes, N. Tsiggos, Evaluation of the relationship between subjects' perception and professional assessment of esthetic treatment needs, *J. Esthetic Restor. Dent.* 19 (3) (2007) 154–162, <https://doi.org/10.1111/j.1708-8240.2007.00089.x>; discussion 63.
- [59] A.S. Brisman, *Esthetics: a comparison of dentists' and patients' concepts*, *J. Am. Dent. Assoc.* 100 (3) (1980) 345–352.
- [60] L.M. Neumann, C. Christensen, C. Cavanaugh, Dental esthetic satisfaction in adults, *J. Am. Dent. Assoc.* 118 (5) (1989) 565–570.
- [61] A.C.L. Holden, L. Adam, W.M. Thomson, The relationship between professional and commercial obligations in dentistry: a scoping review, *Br. Dent. J.* 228 (2) (2020) 117–122, <https://doi.org/10.1038/s41415-020-1195-5>.
- [62] G.J. Christensen, Ethics in the dental PROFESSION—2006, *J. Esthetic Restor. Dent.* 18 (4) (2006) 171–175.
- [63] D.T. Ozar, D.J. Sokol, *Dental Ethics at Chairside: Professional Principles and Practical Applications*, Georgetown University Press, 2002.
- [64] Z.Z. Akarslan, B. Sadik, H. Erten, E. Karabulut, Dental esthetic satisfaction, received and desired dental treatments for improvement of esthetics, *Indian J. Dent. Res.* 20 (2) (2009) 195, <https://doi.org/10.4103/0970-9290.52902>.
- [65] I. Al Shahrani, Self-perception of personal dental appearance among students of king Khaled University Abha, Saudi Arabia, *European J Gen Dent* 3 (3) (2014) 181–184.
- [66] M.K. Al-Omiri, J.A. Karasneh, E. Lynch, P.-J. Lamey, T.J. Clifford, Impacts of missing upper anterior teeth on daily living, *Int. Dent. J.* 59 (3) (2009) 127–132.
- [67] M.K. Afshar, A. Eskandarizadeh, M. Torabi, M.J. Mousavi, I. Mohammadzadeh, Patient satisfaction with dental appearance and related factors—a cross sectional study, *J. Evol. Med. Dent. Sci.* 8 (48) (2019) 3569–3575, <https://doi.org/10.14260/jemds/2019/771>.
- [68] E.I. Alsagob, et al., Impact of self-perceived dental esthetic on psycho-social well-being and dental self confidence: a cross-sectional study among female students in Riyadh city, *Patient Prefer. Adherence* 15 (2021) 919–926, <https://doi.org/10.2147/ppa.S308141>.
- [69] J. Traebert, et al., Brazilian dentists' restorative treatment decisions, *Oral Health Prev. Dent.* 3 (1) (2005) 53–60.
- [70] I. Walker, D. Gilbert, K. Asimakopoulou, Are clinical decisions in endodontics influenced by the patient's fee-paying status? *Br. Dent. J.* 219 (11) (2015) 541–544, <https://doi.org/10.1038/sj.bdj.2015.921>; discussion 5.
- [71] L.M. Sykes, W.G. Evans, F. Gani, In my mouth": Part 11: ethical concerns regarding dental over-treatment and under-treatment, *SADJ* 72 (6) (2017) 281–283.
- [72] I.M. Gheorghiu, P. Perlea, A.N. Temelcea, Ethical issues related to dental bleaching, *Rom. J. Leg. Med.* 27 (2019) 78–82.
- [73] A.C. Holden, L. Adam, W.M. Thomson, Overtreatment as an ethical dilemma in Australian private dentistry: a qualitative exploration, *Community Dent. Oral Epidemiol.* 49 (2) (2021) 201–208, <https://doi.org/10.1111/cdoe.12592>.
- [74] World Health Organization, American Dental Association, Principles of Ethics and Code of Professional Conduct, 2016 C, 11, <http://www.ada.org/about-the-ada/principles-of-ethics-code-of-professional-conduct>.
- [75] F. Najarzagadan, F. Eslamipour, Laypersons' perception of smile esthetics from different backgrounds, *Dent. Res. J.* 21 (1) (2024) 30.
- [76] A.H. Sadrhaghghi, A. Zarghami, S. Sadrhaghghi, A. Mohammadi, M. Eskandarinezhad, Esthetic preferences of laypersons of different cultures and races with regard to smile attractiveness, *Indian J. Dent. Res.* 28 (2) (2017).