



Orthodontic Innovations: Balancing Accessibility with Patient Safety

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ABSTRACT:

BACKGROUND: This study aimed to examine how the general public perceives, understands, and prefers orthodontic treatment provided by a professional orthodontist compared to the concept of do-it-yourself orthodontics without professional supervision. Additionally, the secondary goal was to gauge public awareness regarding the risks and limitations associated with do-it-yourself orthodontics.

METHOD: The population under study was selected through random sampling, and a total of 523 individuals without professional experience or background in dentistry and orthodontics participated in an online survey comprising 28 close ended questions. Subsequently, the data collected underwent statistical analysis using SPSS v21 software.

RESULTS: Around 72% of the participants were not satisfied with their naturally occurring smile, and had malpositioned teeth. It was evaluated if lay people knew the difference between a general dentist and an orthodontic specialist, and only 52% of them were aware of it. 40% of the participants think that using aligners without dentist's supervision is safe. 88.25% of the public has agreed that an orthodontist plays an important role in monitoring treatment progress.

CONCLUSION: the study revealed a substantial portion of the surveyed population's inclination toward DIYO, driven primarily by aesthetic concerns, reduced treatment time, and financial considerations.

KEYWORDS: DIY Orthodontics, Aligners, Dental Graduates

I. INTRODUCTION

The term "Do-It-Yourself" (DIY) encapsulates the endeavour of individuals undertaking specific tasks without formal expertise, education, or training. These enthusiasts often acquire their skills through self-teaching methods, such as watching online instructional videos or participating in brief workshops. DIYO refers to a patient's self-directed efforts to move teeth without the orthodontist's supervision, and bypassing important diagnostic means^[1]

Addressing malocclusion, or malalignment of teeth, is a complex, multi-step process. It necessitates meticulous treatment planning and the precise execution of the devised treatment plan. Both of these tasks demand specialized education and training, typically involving a minimum of four years of dental school followed by an additional 2 to 3 years of orthodontic residency. It is essential to emphasize that the manipulation of tooth movement is a realm that is not suited for DIY endeavors, as it requires a level of expertise beyond what self-taught enthusiasts may possess. Despite the clear warning against such attempts, there are individuals who still venture into this domain.

Clear aligners, which are transparent and removable thermoformed appliances, exhibit variations in materials, design, and fabrication methods^[2]. In orthodontic treatment, these aligners play a crucial role in sequentially correcting displaced teeth associated with malocclusion. However, achieving treatment objectives often involves additional procedures, such as tooth extractions, interproximal reduction (IPR), and the application of composite resin attachments to enamel^[3].

A noteworthy recent development is the emergence of manufacturers offering clear aligner treatment directly to the general public, termed as 'direct to consumer' (DTC)^[4]. This approach, alternatively known as "Direct-to-Customer"



(DTC) or "Doctor-Directed," and marketed as "At Home Clear Aligner Therapy," introduces a paradigm shift in orthodontic accessibility. It is important to note that the label "doctor-directed" may be misleading, and the distinction between do-it-yourself orthodontics (DIYO) and DTC is subtle.

Under the DTC model, consumers can conveniently purchase online kits containing instructions and necessary materials to create dental impressions in the comfort of their homes. These self-made impressions are then sent to the company, and in return, customers receive a tailored set of "aligner" trays. These trays are designed to be worn daily, facilitating the gradual movement of teeth into the desired position. Companies operating under this model assert that they provide the necessary "guidance" for individuals to effectively straighten their teeth from the convenience of their homes^[5].

Clear aligners present numerous purported benefits when compared to traditional fixed appliances. They are linked to enhanced oral hygiene and increased comfort^[6,7], addressing aesthetic concerns related to fixed labial appliances. Additionally, the proposed advantages of direct-to-consumer (DTC) aligners include shorter treatment times, convenience, and reduced costs^[8].

These advantages likely contribute to the growing popularity of clear aligners as a preferred orthodontic treatment modality, especially among adults who prioritize factors such as comfort, aesthetics, and efficiency. The internet has played a pivotal role in revolutionizing global communication, facilitating the dissemination of information about these advancements and fostering a broader understanding of available orthodontic options^[9,10].

Traditionally, clear aligner treatment has been administered by orthodontists and general dental practitioners who possess the expertise and training required for tasks like obtaining high-quality impressions^[11]. Precision in this step is crucial as errors can lead to misdiagnosis and treatment inaccuracies^[12]. Studies have consistently demonstrated that orthodontists, with their specialized training, dedicate more time to treatment planning, resulting in superior treatment outcomes compared to general practitioners without extensive orthodontic specialization^[13].

In stark contrast, do-it-yourself orthodontics (DIYO) lacks essential elements such as medical/dental history, physical examination, and comprehensive diagnostic records. DIYO companies place the responsibility on the client to seek dental care before and after treatment. Clients,

upon purchasing a DIYO kit, are required to complete a questionnaire and sign informed consent and arbitration agreements. In this model, when a layperson initiates a DIYO plan, a notification is sent to a dentist or orthodontist via email for the review of the customer's treatment plan.

It's important to note that DIYO focuses solely on aligning anterior teeth over a few months, with clients receiving new aligner sets through mail shipments. The self-evaluation of results emphasizes that the treatment is not "doctor-directed". Furthermore, crucial elements such as comprehensive records, treatment objectives, alternative plans, clinical findings, and proper informed consent are absent in the DIYO process. These omissions, from a legal standpoint, limit an orthodontist's ability to substantiate decisions and interactions during the treatment^[14]. The absence of in-person professional supervision allows companies to offer treatment at significantly lower costs, making it accessible to a broader audience^[15].

Concerns raised by regulatory agencies and dental/orthodontic professional bodies regarding direct-to-consumer (DTC) aligners underscore the importance of acknowledging potential adverse oral health outcomes in the absence of direct interaction with appropriately trained clinicians. These concerns emphasize the need for clinicians to assess, plan treatment, provide appliances, and monitor progress.

The rising acceptance of DIY orthodontics among the public is a matter of serious consideration. The orthodontic and dental community must recognize the potential threat this new technology poses to public health and proactively manage and license it. Failure to address this issue could lead to negative impacts on the orthodontic specialty, particularly when the public seeks out DIY orthodontics over professional treatment due to its convenience and financial benefits.

DIY orthodontics becomes a significant threat as it not only competes with orthodontists but also has serious implications for public health. Poor treatment outcomes often necessitate professional orthodontic intervention to rectify errors. This dual challenge emphasizes the ways in which DIY orthodontics poses a threat to the field^[16].

However, the DIY orthodontic movement also presents an opportunity. The increased publicity surrounding this technology has heightened awareness about the importance of achieving a beautiful smile. Moreover, it has



sparked interest among the adult population in pursuing orthodontic treatment. From an orthodontist's perspective, DIY orthodontic kits serve as a unique form of advertising, generating an influx of patients into orthodontic practices.

In exploring the public's attitude towards aligners without orthodontist supervision, a survey aims to gauge implicit trust in aligner companies and perceptions of treatment safety. Secondary objectives include delving into motivations behind choosing DIY orthodontics. Understanding these attitudes is crucial for grasping the evolving landscape of orthodontic care and its potential implications on public health.

II. METHODOLOGY

The present study was descriptive, cross-sectional, questionnaire based conducted to assess the public perceptions and understanding of risks associated with Do It Yourself Orthodontics (DIYO)

Inclusion Criteria: Inclusion standard consisted of lay people/ general population.

Subjects satisfying the inclusion standard were asked to fill the questionnaire. The survey questions were designed to estimate respondent's perception and understanding of risks associated with Do It Yourself Orthodontics.

Lastly, all data was entered in an excel sheet and statistical analysis was performed.

Sample size Determination: The source of data was primary. To ensure questionnaire validity and determine the necessary sample size, a preliminary pilot study was conducted. The questionnaire underwent pilot testing with 20 dentists who were asked to fill it. The necessary modifications were made accordingly in the final questionnaire

Reliability of questionnaire was evaluated using Cronbach's alpha value that was **0.612**. To establish the required sample size, the assumed population prevalence (p) was set at **30%**, confidence level (1-α) of 95% was chosen,

corresponding to a Z value of 1.96, with an absolute precision(d) set at 0.05. based on these parameters, the minimum sample size (n) was calculated to be 576.

$$n = Z^2 \times p \times (1-p) / d^2$$

Considering 10% of non-responsiveness, sample size is calculated as

$$N = n / 0.9 = 576 / 0.9 = 640$$

Data collection: A self-administered questionnaire was designed by drawing insights from previous literature on public perceptions and understanding of risks associated with DIYO. The questionnaire comprised of 28 close-ended questions. The questions were designed to 1) obtain general information of the participants encompassing personal data and the socio-demographic profile. 2) Evaluate the respondent's knowledge of orthodontics. 3) Evaluate the respondent's awareness and comprehension of the risks associated with DIYO. The questionnaire was designed to take approximately 5 minutes to complete

Sampling methodology: Random sampling was used to obtain the sample population. The study involved approaching general population. After meeting the inclusion criteria, participants were informed about the study's objectives and asked to fill the questionnaire which was shared to them through an online link, and filling it out was considered as consent before their involvement in study. They were assured of the confidentiality of their responses and were requested to give appropriate answers

The obtained data was entered in micro excel sheet and subsequent statistical analysis was conducted.

For technical aspects, spss version 21.0 was utilized.

III. RESULT

The study received 523 completed responses. Gender wise it was 55.8% females and 44% males. Most of the participants were between the age group of 18 to 36.

Distribution of study population according to Gender		
Gender	(N)	Percentage
male	231	44.2
female	292	55.8
Total	523	100.0

Table1: Gender distribution

Are you satisfied with your naturally occurring smile/ teeth alignment			
	(N)	Percentage	P Value
yes	146	27.9	0.001
no	377	72.1	
Total	523	100.0	

Table2: assessment of contentment with natural smile



Around 72% of the participants were not satisfied with their naturally occurring smile, and had malpositioned teeth.(Table 2)

This data was statistically significant ($p < 0.001$)

-Laypeople’s familiarity with dentistry:

Are you aware about the difference between a general dentist and an orthodontist		
	(N)	Percentage
yes	272	52.0
no	251	48.0
Total	523	100.0

Table3.Awareness of difference between general dentist and orthodontist.

In the second section of the questionnaire, it was evaluated if lay people knew the difference between a general dentist and an orthodontic specialist, and only 52% of them were aware of it.(Table3)

95.8% of the population under study had heard about Braces and aligners used for orthodontic purposes.

When individuals were questioned about the responsibilities of an orthodontist, majority (41.3%) of them thought it to be teeth alignment followed by smile design (21.4%).

Do you know what an orthodontist deals with			
	(N)	Percentage	P value
teeth alignment	216	41.3	0.001
bite problems	86	16.4	
smile design	112	21.4	
malpositioned teeth	26	5.0	
crowded teeth	66	12.6	
space between teeth	17	3.3	
Total	523	100.0	

Table4. Assessment of roles of orthodontist.

27.3% participants had problems in public while smiling, 25.9% while eating food, 5.7% while talking and 41% had problems in public due to all these reasons.(table4)

These findings were statistically significant ($p = 0.001$).

Out of the total respondents, 81.1% had realized the need of orthodontic treatment in them. Majority of the respondents think that teeth can be straightened by braces, while only 18.5% of them think aligners can be used to straighten teeth. Around 39% of public thinks that both of these, including surgical treatment, can be used to straighten teeth.

69.2% of the total population under study are aware of removable orthodontic aligners.

But only 21% of the population have bought aligners to straighten their teeth.

Disappointingly, 40% of the participants think that using aligners without dentist’s supervision is safe. The most important part of this survey was to gather information about laypeople’s desire to utilize DIYO. 112 Out of 523 people have bought aligners, and 107 out of them have experienced side effects. In regard to who would be responsible for detecting issues or problems that may occur during DIYO, 50% of the population said they themselves would take the responsibility. highlights public perception about the edges of aligners

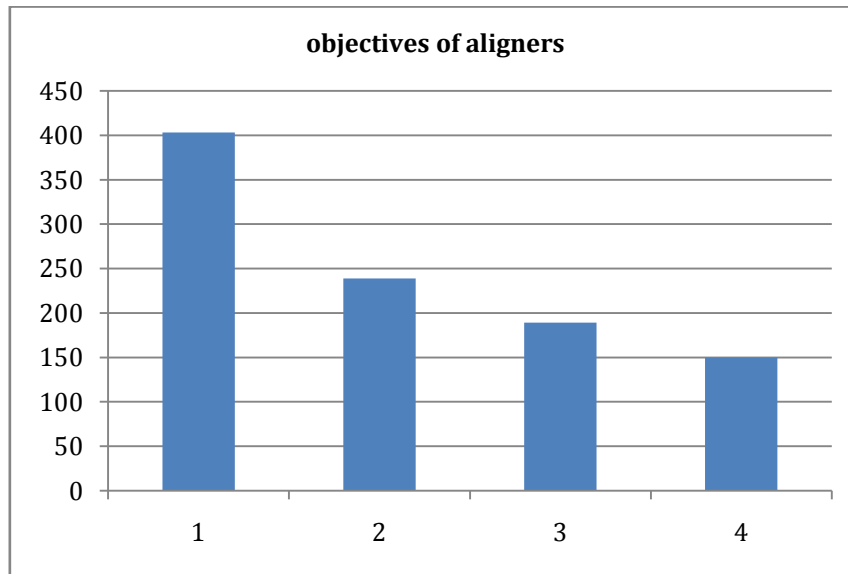


Fig1. Objectives of aligners perceived by participants.

1.improve smile 2.straighten teeth 3.improves chewing 4.improves facial appearance

Of the 523 respondents, 403 think aligner can improve smile, 239 of them are of the opinion that aligner can straighten teeth, 189 have reported that

it improves chewing and 150 believe that it improves facial appearance.

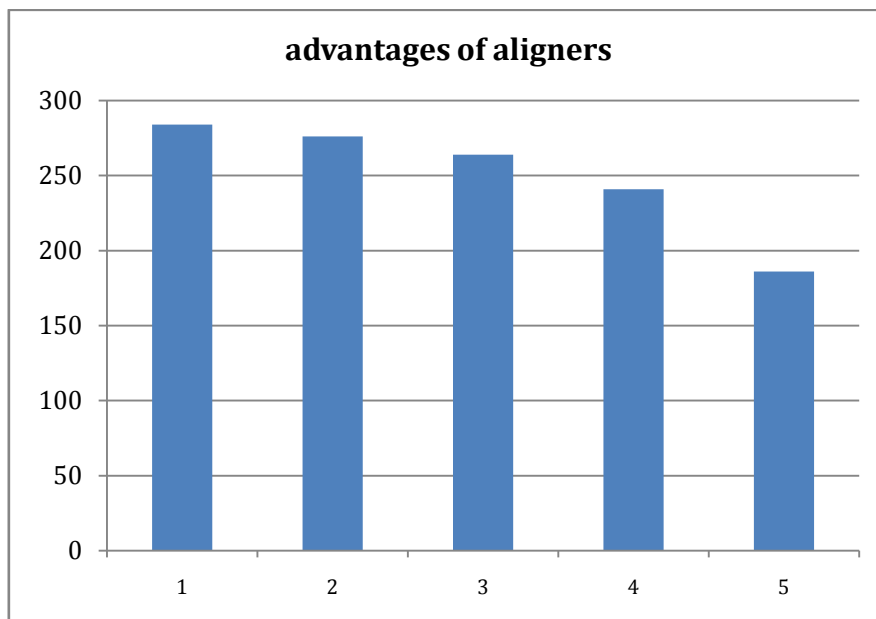


Fig2.advantages of aligners (1.more comfortable 2.less time consuming 3.can enjoy favourite food 4. Removable 5.avoid soft tissue trauma)

Aligners are considered more comfortable in contrast to braces by a majority of public.(fig2), they are less time-consuming, and removable. Additionally, individuals can continue to enjoy their favorite food with aligners, they also help to avoid soft tissue trauma.

Toothsi aligners company is recognized by 73.6% of respondents, while Invisalign is known by 48.6% of participants.

With regards to drawbacks of aligners, 28.9% mention a bad smell, 14.1% cites appliance pain, and 10% associate it with a bad taste. Approximately 50% of respondents have identified all of these concerns.



We asked laypeople the reasons why they would consider utilizing DIYO. The main reason for considering DIYO was they didn't want to compromise aesthetics by putting on braces (71.3%). The second most common reason was reduced treatment time (39.6%).

The third most prevalent reason was a combination of financial considerations and the perception that the distance to the orthodontic clinic is too far.

For the total population, other popular reasons were divided amongst the promise of having their money refunded, some of them considered the alignment of only front teeth to be important, some considered their malocclusion easy to fix, while others believed that they have enough knowledge of dentistry.

In determining the key aspects for planning orthodontic treatment, 63.5% of the population prioritized X-rays, while 47.2% considered clinical evaluation crucial. Additionally, 35% highlighted the significance of intraoral and extraoral photographs, while alternative perspectives included the importance of diagnostic records, recording dental/medical history, physical examination, or intraoral scans.

A significant portion of the population, comprising 58.3%, expressed consensus on the criticality of thorough clinical evaluation

Surprisingly, 44.2% of the total respondents are of the opinion that the orthodontist is evaluating their case, whereas 32.5% of them assume the technician to be doing so. Very few of them believe that a general dentist or the owner of the company is evaluating their case

A total of 88.25% of the public has agreed that an orthodontist plays an important role in monitoring treatment progress

61.6% Individuals opting for aligners hold the expectation that the end result of their orthodontic journey will be a smile characterised by the aesthetic appeal often associated with celebrities. This aspiration reflects a desire for not just dental alignment but a transformative enhancement in the visual attractiveness of their smiles, aligning with the standards often observed in prominent figures. While 24.1% of them eagerly anticipate realistic outcomes that closely align with their desired goals

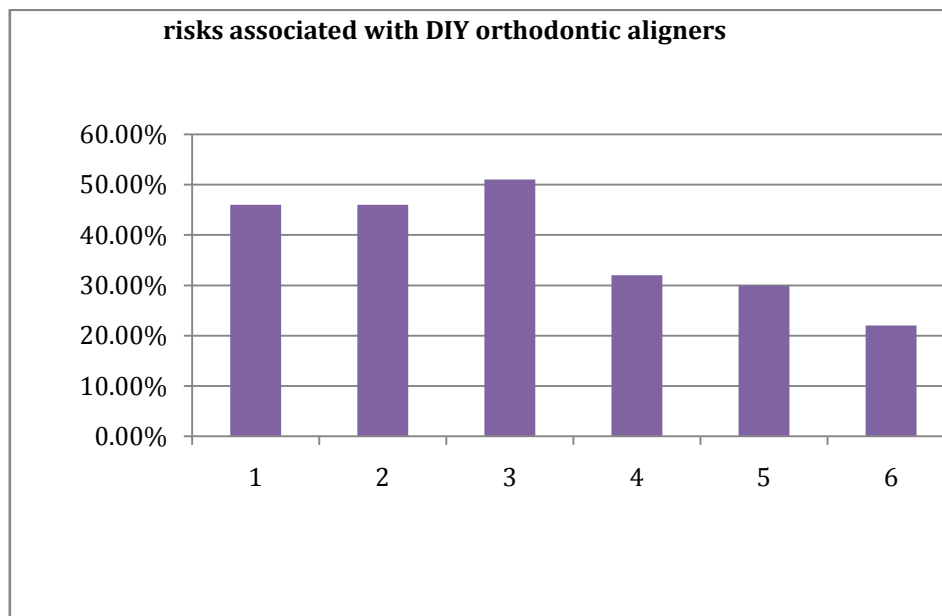


Fig.3 Risks associated with DIYO.

1.Tooth mobility 2.bone loss. 3.Gum disease 4.Breakout on lips. 5.Breakouts on tongue 6.More cavities

Inquiring with laypeople about potential risks associated with aligner use revealed prevalent concerns. The foremost perceived risk was gum disease (including receding gums, gum bleeding, gum swelling), identified by a significant majority. Subsequently, the second most common risk was

twofold: (46.4% each) tooth mobility and bone loss. Followed by breakouts on the lips(33.2%). Following closely were concerns related to fatigue, soreness, and breakouts on the tongue. The least perceived risk among respondents was an increased susceptibility to cavities



Having thoroughly considered the potential risks linked to aligner treatment, a notable 89% of respondents expressed a preference for avoiding such treatment in the future unless under the supervision of a dentist

IV. DISCUSSION

While patients have various motivations for pursuing orthodontic treatment, aesthetics overwhelmingly emerges as the primary driver. A 2009 study indicated that both parents (91.4%) and their children (93.4%) identified aesthetics as the predominant factor influencing their decision to seek orthodontic treatment^[17]. More recent research by Lin et al. highlighted the significant role of psychosocial factors related to dental aesthetics in the decision-making process for adults seeking orthodontic intervention^[18]. Given that the esthetic zone primarily encompasses the anterior dentition, it's logical for individuals to seek relatively straightforward means to enhance this area. This inclination aligns with the appeal of Do-It-Yourself Orthodontics (DIYO), which concentrates specifically on the anterior dentition. Our study's data analysis revealed that aesthetics were the foremost and most influential factor driving laypeople to opt for DIYO.

DIY/DTC companies promote their products as more cost-effective compared to orthodontist-led treatments. Concerning the growing popularity of DIY Orthodontics (DIYO), recent study suggest that the primary motivation is the reduced cost^[19], aligning with the second most prevalent reason identified in our results. This observation aligns with the confidence laypeople exhibit in undertaking DIY Orthodontics (DIYO), particularly when influenced by social media^[20]. For individuals who perceive DIYO as a solution, the minimal investment reinforces their belief in their ability to navigate this path independently. Unfortunately, the potential risks associated with these actions are often overlooked. As highlighted by Froum et al., in certain instances, the repercussions of DIYO can be severe^[21]. The manifestation of an orthodontic issue can be misleading, potentially resulting in failures when inaccurate diagnoses or a lack thereof leads to erratic treatment plans stemming from inadequate medical/dental history. Research by Heath EM et al. indicates that orthodontic residents and orthodontists exhibit a more precise assessment compared to other dental professionals, challenging laypeople's self-perceived understanding of sufficient medical/dental/orthodontic knowledge^[22].

Concerning the providers of orthodontic treatment and the factors influencing laypeople's choices between orthodontists and DIYO, recent research revealed that individuals highly interested in orthodontic treatment tend to seek orthodontists, whereas those with minimal interest prefer DIYO aligners^[23]. This study underscores that the primary reason for choosing an orthodontist is the perceived quality of treatment. Our findings align with this perspective, as laypeople predominantly opt for DIYO driven by considerations of cost and convenience rather than prioritizing the quality of care. Aligned with Melsen's perspective^[24], orthodontics is inherently patient-focused, requiring a discernment between individuals necessitating goal-oriented treatment and personalized appliances. The rise of Do-It-Yourself Orthodontics (DIYO) in recent years has introduced a challenge, as market-driven pressures lead patients towards non-specialists offering what might be termed as 'Fast Food Orthodontics'. To navigate this landscape, orthodontists must acquaint themselves with products presented by non-specialists, enabling effective patient education on new treatment modalities, their merits, and limitations. This empowers patients to make well informed decisions about their orthodontic care. Regarding accountability in the event of issues during or after DIY Orthodontics (DIYO), in our study 25.8% of respondents would attribute responsibility to aligner company owner while 23.5% would hold the technician who comes for taking intra-oral impression for any problems arising from DIYO.

The act of signing the informed consent and arbitration agreement signifies the client's acknowledgment that a dentist has conducted a thorough dental examination, affirming the patient's health from both restorative and periodontal perspectives^[25]. The inquiry is: What is the response from dentists? As trained specialists, it is imperative for us to take a proactive stance in educating the public about potentially harmful DIY health care activities^[26]. There could be value in dedicating time to educate the public and patients while dispelling certain misconceptions. One notable misconception revolves around the perception of safety. Notably, 53.9% of individuals hold the belief that the utilization of aligners is consistently safe. Moreover, 88.9% of respondents express their inclination to abstain from aligner treatment in the future without the supervision of a dentist, having carefully considered all potential risks associated with aligner use. However, 11.1% express a contrary stance, underscoring the imperative need for targeted education aimed at



these individuals. The acknowledgment that some individuals may be drawn to DIYO due to various reasons warrants attention, particularly in designing targeted educational campaigns to enhance awareness about potential pitfalls. Additionally, the distinction between DIYO and professional orthodontic care is essential, as highlighted by the survey, considering the varying levels of awareness among respondents. Instead of issuing blanket warnings against at-home aligners, dentists may find it more constructive to engage in candid discussions with patients about the risks and benefits. Alongside advocating for heightened accountability from direct-to-consumer orthodontics companies, exploring innovative approaches to coexist in this evolving landscape, such as providing professional oversight for DTC treatments, could be advisable. In conclusion, it became evident that a nuanced understanding of public attitudes is crucial for shaping future healthcare policies and educational initiatives for promoting safe and effective orthodontic care in a rapidly evolving landscape.

V. CONCLUSION

The findings collectively advocate for enhanced public education, addressing misconceptions, and fostering a comprehensive understanding of orthodontic treatments. It is evident that there exists a nuanced landscape of perceptions and preferences among laypeople, necessitating targeted efforts to bridge information gaps and promote informed decision-making in the realm of orthodontic care.

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