



Knowledge, Attitude and Perceptions of Clear Aligner Therapy in Metropolitan Cities of South Indian Population– A Cross-Sectional Study

Dr. B. Edward Giftson Noah¹, Dr. S.D. Milling Tania², Dr. S. Veerasankar³, Dr. I. Bevin Shaga⁴, Dr. A. Jebilla Pringle⁵, Dr. Mary Sheloni Missier⁶

¹Postgraduate Scholar, Department of Orthodontics and Dentofacial Orthopaedics, Rajas Dental College and Hospital, Kavalkinaru, Tirunelveli, India (Corresponding Author)

²Professor and Head of the Department, Department of Orthodontics and Dentofacial Orthopaedics, Rajas Dental College and Hospital, Kavalkinaru, Tirunelveli, India

³Reader, Department of Orthodontics and Dentofacial Orthopaedics, Rajas Dental College and Hospital, Kavalkinaru, Tirunelveli, India

⁴Reader, Department of Orthodontics and Dentofacial Orthopaedics, Rajas Dental College and Hospital, Kavalkinaru, Tirunelveli, India

⁵Senior Lecturer, Department of Orthodontics and Dentofacial Orthopaedics, Rajas Dental College and Hospital, Kavalkinaru, Tirunelveli, India

⁶Senior Lecturer, Department of Orthodontics and Dentofacial Orthopaedics, Rajas Dental College and Hospital, Kavalkinaru, Tirunelveli, India

Corresponding Author: Dr. B. Edward Giftson Noah

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ABSTRACT:

Background: Clear aligner therapy represents a significant advancement in orthodontics, offering a more aesthetic and comfortable alternative to traditional fixed appliances. Despite their growing popularity worldwide, awareness and understanding of clear aligners remain limited in metropolitan cities across South India, potentially influencing treatment preferences and outcomes.

Aim: This study aimed to assess the knowledge, awareness, and perceptions of clear aligners among residents of metropolitan cities in South India.

Methodology: A cross-sectional study was conducted among 109 participants aged 18 years and above, recruited through convenience sampling. Data were collected via an online self-administered survey over one month. The survey included 16 questions covering demographics, dental history, awareness, perceptions, and knowledge of clear aligners. Statistical analysis was performed using SPSS software (Version 21.0), employing descriptive statistics and chi-square tests.

Results: Among the 109 respondents, 62.4% were female, with a mean age of 31.23 ± 10.33 years. A majority (77.1%) were aware of clear aligners, with significant gender differences in awareness levels ($p = 0.030$). Dentists were the most common source of information (46.8%), particularly among female respondents ($p = 0.027$). While 78.9% expressed interest in learning more about clear aligners, only 14.7% preferred them over fixed appliances, citing cost as the primary barrier (33.9%). Although 90.8% believed that oral hygiene could be better maintained with clear aligners, awareness of post-treatment care was notably low (39.4%).

Conclusion: This study reveals that while awareness of clear aligners is moderate among residents in South India's metropolitan areas, in-depth knowledge and acceptance remain limited. Targeted educational initiatives by dental professionals are essential to bridge this gap, enabling informed treatment decisions and improved orthodontic outcomes.



Introduction

Advancements in orthodontics have introduced diverse treatment modalities to correct malocclusion and enhance oral health. Traditionally, fixed orthodontic appliances, consisting of metal brackets and wires, have been mainstay of treatment for malocclusion. However, the visibility and discomfort of braces have often deterred patients, particularly teenagers and adults with higher aesthetic demands.⁽¹⁾ Recently, there has been a significant shift towards more aesthetically pleasing orthodontic options. This demand for effective, discreet, and comfortable treatments has led to the rise of clear aligner therapy. Clear aligners are transparent, removable devices that gradually reposition teeth, offering advantages such as improved aesthetics, ease of maintenance, and greater comfort.^(2,3) Although many countries have observed that patients prefer clear aligner therapy, there remains some scepticism about the effectiveness of clear aligners. In Tamil Nadu, even in the metropolitan city of Chennai, the population exhibits only moderate awareness of clear aligners and lacks sufficient knowledge regarding their optimal use for orthodontic treatment. A similar gap in awareness and understanding might exist in other major metropolitan cities of South India. This deficit in knowledge can lead to suboptimal treatment choices and outcomes. Most existing studies have broadly addressed awareness of various orthodontic treatment modalities. There is a notable dearth of research assessing the awareness and knowledge about clear aligners within these South Indian populations. Given the rapid urbanization and increasing demand for aesthetic and effective orthodontic solutions, it is imperative to comprehensively understand public awareness, perception and knowledge about clear aligners. This study seeks to address this critical research gap by providing detailed insights into the awareness and understanding of clear aligners among the metropolitan cities of South Indian population. Thus, this cross-sectional study was conducted to assess the knowledge, awareness, and perception regarding clear aligners among the general public of South India. The objectives is to prepare a questionnaire regarding clear aligners, identify the knowledge, awareness and perceptions regarding clear aligners using questionnaire.

Methodology

This cross-sectional study was conducted with the primary objective of evaluating the level of knowledge, awareness, and perception pertaining to clear aligners within the general public residing in the bustling metropolitan cities of South India. The study population, consisting of a total of 109 respondents, actively participated in the data collection process by completing a meticulously designed Google survey over the course of one month. Since this is an online survey, study employed the convenient sampling technique, which allowed for a relatively straightforward and efficient selection of participants.

Selection Criteria

The inclusion criteria for the study consisted of permanent residents of metropolitan cities in South India, individuals of any gender who were above 18 years of age, and participants who could understand and respond to the survey in English. On the other hand, the exclusion criteria included temporary residents, migrants, individuals below 18 years of age, medical or dental professionals.

Data Collection Procedure

Following the acquisition of ethical clearance, participants were recruited through online platforms, social media, and community groups specific to the target region. They were provided with detailed information about the study's purpose and procedures, and informed consent was obtained electronically. The questionnaire was administered via an online survey platform, ensuring the anonymity and confidentiality of the responses. The study utilized a self-administered online questionnaire consisting of 16 questions to assess the awareness, perception, and knowledge of clear aligners among metropolitan residents of South India. The questionnaire included demographic details, three general information questions related to general dental health and prior orthodontic treatment, three awareness questions assessing participants' familiarity with clear aligners, five perception questions exploring participants' views on the effectiveness, aesthetics, and comfort of clear aligners, and five knowledge questions gauging their understanding of the functionality, benefits, and limitations of clear aligners. The survey remained accessible for duration of one month, allowing any individual who completed the form within



this timeframe to participate in the study. Subsequently, the responses were evaluated to obtain the results. The results were tabulated and analysed using SPSS Software Version 21.0. Descriptive statistics were performed to characterise the sample and assess the knowledge, awareness, and perception regarding clear aligners among the general public residing in metropolitan cities of South India. Chi square test was performed to assess the significant association between categorical variables.

Results

Out of a total of 109 participants, 41 were males and 68 were females with the mean age of 31.23 ± 10.33 years

ranging from 18 to 68. The sociodemographic characteristics reveal a predominance of professionals, with 68 participants (62.4%) engaged in professional occupations, while a smaller percentage are students (24.8%) and a few are unemployed (6.4%). Semi-professional roles (1.8%) and skilled work (3.7%) represent minor portions and only one in clerical or farming positions (0.9%). Regarding educational attainment, 65.1% possess professional or honors degrees, and 29.4% have completed graduate or postgraduate studies. Only a small fraction has intermediate education or diplomas (3.7%), with minimal representation at the high school (0.9%) and primary school (0.9%) levels. (Table 1)

Table 1. Sociodemographic details of the study participants

Variable		n (%)
Gender	Male	41 (37.6%)
	Female	68 (62.4%)
Occupation	Profession	68 (62.4%)
	Semi-profession	2 (1.8%)
	Clerical, Shopowner, Farmer	1 (0.9%)
	Skilled worker	4 (3.7%)
	Semi-skilled worker	0 (0%)
	Unemployed	7 (6.4%)
	Student	27 (24.8%)
Educational level	Profession or honours	71 (65.1%)
	Graduate or postgraduate	32 (29.4%)
	Intermediate or post high school diploma	4 (3.7%)
	High school	1 (0.9%)
	Primary school	1 (0.9%)

Table 2 reveals the knowledge, awareness and perceptions of clear aligners among the study population. A significant majority of respondents (95.4%) reported having visited a dentist, with notable differences between genders; 62.4% of females had dental visits compared to only 33% of males (p value = 0.003). This indicates a statistically significant association, suggesting that gender influences dental visit behavior. Regarding orthodontic treatment advice, 44% of participants reported being advised to undergo orthodontic treatment, with no significant gender differences (p = 0.413). This indicates that irrespective of gender participants received similar advice regarding orthodontic treatments. In terms of orthodontic treatment advised, 18.3% of participants recommended

fixed braces, 9.2% suggested clear aligners, and 15.6% recommended both options. In terms of awareness of clear aligner therapy, a significant portion (77.1%) of the participants had heard about clear aligners, with more females (53.2%) being aware compared to males (23.9%). This association was significant (p = 0.030). Furthermore, the majority of respondents (46.8%) reported learning about clear aligners from dentists, and again, a significant difference (p = 0.027) indicated that females were more likely to receive information from dental professionals than males. Despite this awareness, only a small number (17.4%) had consulted a dentist regarding clear aligners. Opinions on the effectiveness of clear aligners compared to fixed orthodontic treatment are diverse. Around 21.1% rate clear aligners



as highly effective, 27.5% consider them moderately effective, and 16.5% believe they are as effective as fixed braces. However, 34.9% are uncertain, indicating a significant portion with limited knowledge or confidence in comparing clear aligners to traditional fixed treatment. Perceptions and attitudes about clear aligners revealed that only 14.7% preferred clear aligners over fixed options. Additionally, a majority (76.1%) expressed a preference for more comfortable treatment options, but again, there was no significant difference found ($p = 0.303$). Aesthetics was cited by 32.1% as a reason for preferring clear aligners, although the reasons against choosing clear aligners were predominantly related to cost (33.9%), with no significant differences between genders ($p = 0.267$). Interest in learning more about clear aligners was high,

with 78.9% of respondents expressing a desire for more information, although no significant gender differences were noted ($p = 0.105$). When it came to preferred information sources, dentist consultations (45.9%) were the most favoured option followed by workshops/seminars (18.3%). Participants had mixed opinions on the effectiveness of clear aligners with 6.7% believe aligners are universally effective, 17.4% disagree, and a notable 45.9% are unsure ($p = 0.232$) and on maintaining oral hygiene using clear aligners, with 90.8% believing that hygiene could be better maintained using aligners compared to braces. Awareness of postoperative care following clear aligner therapy was low (39.4%) with no significant difference between males (11.9%) and females (27.5%) ($p = 0.199$).

Table 2. Awareness, perceptions, attitudes and knowledge regarding clear aligners in the study participants

Variable	Response	Total n(%)	Male n(%)	Female n(%)	χ^2	P value
GENERAL INFORMATION						
Dental visits	Yes	104 (95.4%)	36 (33.0%)	68 (62.4%)	8.691	0.003
	No	5 (4.6%)	5 (4.6%)	0 (0%)		
Advise to undergo orthodontic treatment	Yes	48 (44%)	16 (14.7%)	32 (29.4%)	0.670	0.413
	No	61 (56%)	25 (22.9%)	36 (33%)		
Type of orthodontic treatment advised	Fixed	20 (18.3%)	6 (5.5%)	14 (12.8%)	4.200	0.380
	Clear aligners	10 (9.2%)	3 (2.8%)	7 (6.4%)		
	Both	17 (15.6%)	5 (4.6%)	12 (11.0%)		
	None	53 (48.6%)	25 (22.9%)	28 (25.7%)		
AWARENESS ON CLEAR ALIGNERS						
Familiarity with clear aligners	Yes	84 (77.1%)	26 (23.9%)	58 (53.2%)	7.020	0.030
	No	23 (21.1%)	14 (12.8%)	9 (8.3%)		
Mode of information regarding clear aligner therapy	Dentist	51 (46.8%)	23 (11%)	38 (34.9%)	10.927	0.027
	Friends/Family	12 (11%)	6 (5.5%)	6 (5.5%)		
	Advertisement/Social Media	19 (17.4%)	6 (5.5%)	13 (11.9%)		
	Others	9 (8.3%)	4 (3.7%)	5 (4.6%)		
Consultation with a dentist for clear aligner therapy	Yes	19 (17.4%)	5 (4.6%)	14 (12.8%)	0.308	0.197
	No	90 (82.6%)	36 (33%)	54		



				(49.5%)		
PERCEPTIONS AND ATTITUDES ABOUT CLEAR ALIGNERS						
Opinions on the effectiveness of clear aligner treatment compared to fixed orthodontic treatment	High	23 (21.1%)	5 (4.6%)	18 (16.5%)	5.769	0.123
	Moderate	30 (27.5%)	12 (11%)	18 (16.5%)		
	Same as fixed	18 (16.5%)	5 (4.6%)	13 (11.9%)		
	Don't know	38 (34.9%)	19 (17.4%)	19 (17.4%)		
Preference for clear aligner treatment over fixed orthodontic treatment	Yes	16 (14.7%)	35 (32.1%)	51 (46.8%)	1.600	0.449
	No	9 (8.3%)	4 (3.7%)	5 (4.6%)		
	Not sure	49 (45%)	21 (19.3%)	28 (25.7%)		
Preference for a more comfortable treatment option rather than fixed orthodontic treatment	Yes	83 (76.1%)	29 (26.6%)	54 (49.5%)	1.061	0.303
	No	26 (23.9%)	12 (11.0%)	14 (12.8%)		
Reasons for preferring clear aligners	Aesthetics	35 (32.1%)	10 (9.2%)	25 (22.9%)	9.159	0.165
	Comfort	27 (24.8%)	9 (8.3%)	18 (16.5%)		
	Convenience	9 (8.3%)	3 (2.8%)	6 (5.5%)		
	Shorter treatment time	3 (2.8%)	1 (0.9%)	2 (1.8%)		
	Less painful	11 (10.1%)	3 (2.8%)	8 (7.3%)		
	Others	8 (7.3%)	6 (5.5%)	2 (1.8%)		
Reasons for not preferring clear aligners	Cost	37 (33.9%)	11 (10.1%)	26 (23.9%)	6.422	0.267
	Lack of awareness/information	9 (8.3%)	5 (4.6%)	4 (3.7%)		
	Trust in traditional braces	5 (4.6%)	0 (0%)	5 (4.6%)		
	Perceived effectiveness	2 (1.8%)	1 (0.9%)	1 (0.9%)		
	Others	14 (12.8%)	7 (6.4%)	7 (6.4%)		
KNOWLEDGE ABOUT CLEAR ALIGNERS						
Interested in learning more about clear aligner therapy	Yes	86 (78.9%)	29 (26.6%)	57 (52.3%)	2.633	0.105
	No	23 (21.1%)	12 (11.0%)	11 (10.1%)		
Sources of information preferred for learning about clear aligner therapy	Dentist consultations	50 (45.9%)	19 (17.4%)	31 (28.4%)	7.106	0.213
	Friends/Family recommendations	9 (8.3%)	4 (3.7%)	5 (4.6%)		



	Internet research	8 (7.3%)	5 (4.6%)	3 (2.8%)		
	Advertisements/ Social Media	6 (5.5%)	1 (0.9%)	5 (4.6%)		
	Workshops/ Seminars	20 (18.3%)	4 (3.7%)	16 (14.7%)		
	Others	16 (14.7%)	8 (7.3%)	8 (7.3%)		
Clear aligners can correct all types of Malalignment.	Yes	40 (36.7%)	11 (10.1%)	29 (26.6%)	2.924	0.232
	No	19 (17.4%)	9 (8.3%)	10 (9.2%)		
	Not sure	50 (45.9%)	21 (19.3%)	29 (26.6%)		
Maintenance of oral hygiene better with clear aligners than braces	Yes	99 (90.8%)	36 (33%)	63 (57.8%)	0.720	0.396
	No	10 (9.2%)	5 (4.6%)	5 (4.6%)		
Awareness of postoperative care after clear aligner therapy	Yes	43 (39.4%)	13 (11.9%)	30 (27.5%)	1.649	0.199
	No	66 (60.6%)	28 (25.7%)	38 (34.9%)		

DISCUSSION

Clear Aligners are custom fabricated braces with numerous advantages including its enhanced comfort and the ability to remove them for eating and oral hygiene along with superior aesthetic appeal as they remain virtually imperceptible, shorter treatment time, thus accommodating a diverse array of orthodontic concerns.⁽⁴⁻⁶⁾ Despite these benefits, Clear aligner therapy (CAT) faces notable challenges, as this is not universally applicable, particularly for complex orthodontic cases characterized by severe malocclusions, significant crowding or substantial spacing discrepancies, which often require the intervention of traditional braces.⁽⁶⁾ Furthermore, concern is patient compliance; effective treatment necessitates that aligners be worn for a minimum of 22 hours daily, and failure to adhere to this protocol may lead to extended treatment durations or suboptimal outcomes.⁽⁷⁾ Additionally, patients may encounter difficulties in maintaining adequate oral hygiene, increasing the risk of caries, gingivitis, and malodor. Lastly, CAT is generally associated with higher costs compared to conventional orthodontic treatments, and it frequently lacks insurance coverage, thus limiting its accessibility.⁽⁴⁾ Despite the well-documented advantages and limitations of Clear Aligner Therapy (CAT), there is a lack of comprehensive studies examining the

awareness of clear aligners among the general population, particularly in metropolitan cities of South India. Thus, this cross-sectional study assessed the knowledge, awareness, and perception regarding clear aligners among the general public of South India. In the present study, 77.1% of respondents were familiar with clear aligner therapy, indicating a positive trend in the high level of awareness regarding clear aligners treatment. Notably, dental professionals were identified as the primary source of information, with 46.8% of participants relying on them for guidance, emphasizing the critical role dentists play in educating patients about orthodontic treatments. However, perceptions of effectiveness varied, as only 21.1% rated clear aligners as highly effective, and a significant 34.9% expressed uncertainty about their efficacy. This uncertainty points to a pressing need for improved patient education regarding the effectiveness of clear aligners. Furthermore, preference for clear aligner treatment was relatively low, with only 14.7% indicating a willingness to choose clear aligners over traditional fixed treatments, and 45% remaining unsure. Comfort and aesthetics emerged as significant factors in treatment decisions, with 76.1% of respondents expressing a preference for comfortable options and citing aesthetics (32.1%) and comfort (24.8%) as key reasons for favouring clear aligners. Cost also emerged as a notable



barrier to adoption, with 33.9% citing it as a deterrent. 95.4% of respondents reported having visited a dentist in this study, closely aligning with the findings of Alharbi et al. (96%)⁽⁸⁾ and Haridasan et al. (90%)⁽⁹⁾ demonstrating a consistently high rate of dental visits. In contrast, Pawar et al. reported a significantly lower proportion, with only 47.99% having visited a dentist, suggesting a notable disparity in dental care access or awareness across different populations. Regarding orthodontic advice, 44% of respondents were advised to undergo treatment. However, among those advised, 18.3% were recommended fixed appliances, 9.2% clear aligners, and 15.6% both. In comparison, Pawar et al.⁽¹⁰⁾ reported a higher recommendation rate for fixed appliances (56.97%) and clear aligners (38.06%). Almotairy N⁽¹¹⁾ also showed a predominant preference for traditional fixed braces (73.17%), while Bilal MF et al.⁽¹²⁾ findings (77.7% fixed appliances) were similarly aligned with these results, indicating a broader preference for fixed treatments across studies. Furthermore, despite females receiving more information from dental professionals about clear aligner therapy, the guidance provided by dentists regarding the necessity for orthodontic treatment did not demonstrate significant gender differences. This finding suggests that participants, regardless of gender, received consistent advice on orthodontic treatments, emphasizing the uniformity of professional dental guidance and the importance of equitable access to orthodontic information for all patients. In the current study, 77.1% of respondents were aware of clear aligner therapy, closely aligning with Alharbi et al.,⁽⁸⁾ where 76.5% reported awareness. In contrast, Haridasan et al.⁽⁹⁾ noted a lower awareness rate at 50%, while Pawar et al.⁽¹⁰⁾ and Bilal MF et al.⁽¹²⁾ reported 62.88% and 63.2% awareness, respectively, suggesting varying levels of familiarity with clear aligners across different populations. Regarding information sources, the current study found 46.8% learned about clear aligners from their dentist, 17.4% from social media, and 11% from friends or family. Alharbi et al.⁽⁸⁾ reported a higher reliance on social media (28.5%) and a lower percentage receiving information from dentists (23%). Pawar et al.⁽¹⁰⁾ study emphasized digital media as the primary source (73.05%), reflecting a growing trend toward social media as a key avenue for disseminating information on clear aligners, in contrast to the current study's stronger reliance on dentists. Only 17.4% of

respondents in this study had consulted a dentist regarding clear aligners, significantly lower than the 41% consultation rate reported by Bilal MF et al.⁽¹²⁾ This indicates that despite high awareness, consultation rates for clear aligner therapy vary widely, with the current study showing a notably lower engagement with dental professionals compared to other studies. With regard to perception, 21.1% of respondents rated the effectiveness of clear aligner treatment as high, 27.5% as moderate, and 34.9% were unsure. This contrasts sharply with Alharbi et al.,⁽⁸⁾ where 74.5% rated clear aligners as highly effective, and Pawar R et al. reported an even higher effectiveness perception at 87.71%. Bilal MF et al.⁽¹²⁾ findings indicated that 55.8% found clear aligners relatively effective, aligning more closely with the current study's uncertainty. With regard to preference, only 14.7% of respondents favoured clear aligners over fixed treatments, while 45% were unsure. Alharbi et al. and Bilal MF et al. reported a slightly higher preference of 23.5% and 41.3% respectively, whereas in contrast, Pawar et al. study showed a strong preference for clear aligners at 76.83%, highlighting significant variability in preference across studies. A significant 76.1% of respondents in the current study preferred a more comfortable treatment option compared to fixed braces, which aligns with Pawar et al. finding of 83.92%. Almotairy et al., however, noted that only 34.9% acknowledged reduced discomfort with clear aligners. This suggests that comfort significantly influences treatment choices. Furthermore, participants cited aesthetics (32.1%), comfort (24.8%), and convenience (8.3%) as key reasons for preferring clear aligners. Similarly, Alharbi et al. noted respondents favoured clear aligners for their aesthetic appeal and reduced pain. Pawar et al. found that 54.37% believed clear aligners were more aesthetic, reinforcing the importance of these factors in patient decision-making. Barriers to choosing clear aligners included cost (33.9%), lack of awareness (8.3%), and trust in traditional braces (4.6%), aligning with Pawar et al., who found cost to be a barrier for 69.03% of respondents. Additionally, 78.9% of respondents expressed interest in learning more about clear aligner therapy. The knowledge on clear aligners effectiveness varied, with 36.7% of current study participants believing they could correct alignment issues, while Pawar et al.⁽¹⁰⁾ reported that 63.36% affirmed their effectiveness. Furthermore, 90.8% of respondents in the



current study believed that oral hygiene could be better maintained with aligners, contrasting with 55.19% of Almotairy N⁽¹¹⁾ participants who held the same view. Finally, only 39.4% of current study respondents were aware of postoperative care following clear aligner therapy. The disparity in findings between the current study and others may be attributed to the urban context in which this research was conducted. Metropolitan areas often have better access to dental care and information sources, resulting in higher awareness levels about clear aligner therapy. This urban setting likely influences perceptions and preferences, leading to differences in reported effectiveness, comfort, and overall satisfaction with clear aligners. Moreover, cultural factors, socioeconomic status, and the prevalence of dental professionals in these cities can further contribute to varying levels of familiarity and attitudes toward orthodontic treatments. The study also presents certain limitations. The convenience sampling method may introduce election bias, as it does not ensure a representative sample. Online recruitment may skew results, as participants likely possess higher digital literacy and access to dental information. Additionally, self-reported data could lead to overestimations of knowledge due to social desirability. While the sample size provides preliminary insights, it is relatively small, limiting generalizability across metropolitan regions. The focus on urban areas restricts applicability to rural populations, where perceptions may differ.

CONCLUSION

Thus, this study reveals that while 77.1% of respondents were aware of clear aligner therapy, only 21.1% rate its effectiveness highly, with 34.9% uncertain about its efficacy. A mere 14.7% prefer clear aligners over traditional fixed braces, influenced primarily by considerations of comfort and aesthetics. Cost remains a significant barrier, cited by 33.9% of participants. Although most had visited a dentist, few received recommendations for clear aligners, highlighting a stronger inclination toward traditional treatments. These findings indicate a crucial need for targeted educational campaigns by orthodontic professionals to address misconceptions and improve awareness of clear aligners among potential patients.

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