Journal of Dental Sciences 20 (2025) 1095–1101

Available online at www.sciencedirect.com

ScienceDirect

journal homepage: www.e-jds.com

Original Article

Practice profiles of orthodontists in Taiwan

Johnson Hsin-Chung Cheng [a,b*], Chia-Hui Wu [b], Daniel De-Shing Chen [a,b]

[a] School of Dentistry, College of Oral Medicine, Taipei Medical University, Taipei, Taiwan
[b] Orthodontic Division, Department of Dentistry, Taipei Medical University Hospital, Taipei, Taiwan

Received 12 November 2024; Final revision received 24 December 2024
Available online 9 January 2025

KEYWORDS
Correlation analysis;
Clinical practice;
Demographics;
Orthodontics;
Practice profile;
Taiwan

Abstract *Background/Purpose:* Realization of orthodontists' practice profiles is crucial for orthodontic development, which has been performed in many countries. This study aimed to realize the practice profiles and affecting factors of orthodontists in Taiwan because there is no similar research in recent decades. Our findings may be important references for the orthodontic development.
Materials and methods: An anonymous survey was conducted the Taiwan Association of Orthodontists (TAO) annual meeting on December 8, 2018. The questionnaire comprised 37 questions including demographics, practice profiles, patient profiles, and orthodontic mechanisms. Descriptive statistics were used to determine the distribution of the study variables. Pearson correlation and multiple linear regression analyses were performed to identify correlations between the orthodontists' practice profiles and demographics.
Results: 648 orthodontists were approached for the survey, and 177 questionnaires were returned (response rate: 27.3 %). A goodness-of-fit test confirmed that our cohort did not differ significantly from the members of the TAO in 2023. Our findings revealed that 60 % of the orthodontists were practicing in the northern Taiwan. 46 % of the orthodontists regularly used temporary anchorage devices (TADs). 40 % of the orthodontists reported that >50 % of their patients were referred by other patients. 79.4 % of the orthodontists charged between $3200 and $5000 for adult patients.
Conclusion: This study provides an overview of the practice profiles of orthodontists in Taiwan. Our fundings highlighted the uneven distribution of orthodontists within Taiwan and the widespread use of TADs. Word of mouth remains a crucial factor in patient referrals.

* Corresponding author. School of Dentistry, College of Oral Medicine, Taipei Medical University Orthodontic Division, Department of Dentistry, Taipei Medical University Hospital No. 250, Wuxing St., Xinyi District, Taipei City 110. Taiwan.
E-mail address: g4808@tmu.edu.tw (J.H.-C. Cheng).

https://doi.org/10.1016/j.jds.2024.12.023

Introduction

Understanding the practice profiles of orthodontists is essential for evaluating their professional perspectives, identifying global trends, and devising policies for orthodontic development. The United States has conducted biennial orthodontic surveys since 1980, focusing on changes since 2013. The median cost of orthodontic treatment for adults in the United States increased from $2100 in 1981 to $5990 in 2019. Moreover, the median number of active cases per year increased from 300 in 1981 to 555 in 2019.[1,2] These surveys are conducted to understand all aspects of orthodontists' practice profiles, patient profiles, and treatment mechanisms.[1,2] Similar surveys have been conducted across countries such as Brazil, Australia, and New Zealand. In Brazil, studies have focused on orthodontists' professional characteristics, patient demographics, and treatment techniques. Insights from these studies considerably influence policies related to orthodontics.[3] Mathew et al. conducted a survey among orthodontists, comparing practical challenges and temporal changes between Australia and New Zealand.[4]

Given the lack of recent studies (conducted within the past 10 years) on the practice profiles of Taiwanese orthodontists, updated surveys are urgently required to gain comprehensive insights. In this study, we explored the practice profiles of Taiwanese orthodontists and compared these between Taiwan and various countries to enhance orthodontic services, treatment quality, and the development of orthodontic policy.

Materials and methods

This study was conducted in accordance with the ethical principles of the Declaration of Helsinki. The study protocol was approved by the research ethics committee of the study institute (approval number: N201803025).

An anonymous survey questionnaire was developed based on literature and current conditions in Taiwan. The questionnaire comprised 37 questions, which collected data on respondents' demographic (5 questions), practice profiles (8 questions), patient profiles (14 questions), and orthodontic treatment mechanisms (10 questions). Before the survey, the questionnaire was validated by three orthodontic specialists. It obtained a score of 0.70 in a pilot test and the Kappa reliability test, indicating substantial agreement among the questionnaire items.

A survey was conducted among orthodontists who attended the Taiwan Association of Orthodontics (TAO) Annual Meeting on December 8, 2018. The participants read the instructions carefully before completing the questionnaire. Data were collected only from orthodontists who agreed to participate in this study and signed a consent form. Completed questionnaires were returned to reception before the closing ceremony.

Goodness-of-fit tests were conducted to determine whether the characteristics of our cohort differed from those of the TAO members in 2023. The survey responses were subjected to descriptive analyses, and the data are presented in terms of frequency and percentage values. Pearson correlation and multiple linear regression analyses were performed to identify correlations between the orthodontists' practice profiles and their demographics. Data were analyzed using SPSS (version 19; IBM Corporation, Armonk, NY, USA). Statistical significance was set at $P < 0.05$.

Results

Demographic

For the survey, we approached 648 board-certified orthodontists. A total of 177 questionnaires were returned (response rate: 27.3 %). In 2023, the total number of TAO members was 775.

Table 1 presents the demographic characteristics of the study cohort and those of the TAO members in 2023. Goodness-of-fit tests, analysis of variance, and *P* values indicated that the two cohorts did not differ significantly,

Table 1 Demographic and 2023 TAO demographic.

	Respondents	People (%)	2023 TAO people (%)	ANOVA (*P value*)
Age	<40:	94 (53.4 %)	321 (41.4 %)	11.09 (0.0039*)
	40～60:	73 (41.4 %)	329 (42.4 %)	
	>60	9 (5.2 %)	125 (16.2 %)	
Gender	Male	82 (46.6 %)	436 (56.3 %)	3.83 (0.05)
	Female	94 (53.4 %)	339 (43.7 %)	
Area in Taiwan	North	97 (55.1 %)	463 (59.7 %)	2.14 (0.544)
	Middle	26 (14.7 %)	127 (16.4 %)	
	South	52 (29.5 %)	181 (23.4 %)	
	East	1 (0.5 %)	4 (0.5 %)	
Institution	Hospital	51 (29.7 %)		
	Local clinic	121 (70.3 %)		
Clinical frequency (1unit = 3 h)				
	<6 unit/week	33 (18.9 %)		
	7—9 unit/week	65 (37.4 %)		
	10—12 unit/week	61 (35.1 %)		
	>13 unit/week	15 (8.6 %)		

*Significant difference ($P < 0.05$); TAO: Taiwan association of orthodontists.

Table 2 Orthodontic practice profiles.

Respondents	People (%)	Respondents	People (%)
Practice pattern		**Treatment fee (Children)**	
In charge	59 (33.7 %)	Under $3.2T	60 (34.1 %)
Employed	117 (66.3 %)	$3.2T - $5T	109 (61.8 %)
		$5T - $6.5T	7 (4.1 %)
		Over $6.5T	0 (0 %)
Working hours per week		**Down payment/treatment fee**	
under 6 units	33 (18.9 %)	0∼25 %	92 (52.0 %)
7–9 units	66 (37.4 %)	26–50 %	77 (43.9 %)
10–12 units	62 (35.1 %)	over 50 %	7 (4.1 %)
over 13 units	16 (8.6 %)		
Evening clinic per week		**Payment of return visit**	
Under 2 units	62 (35.1 %)	Under $60	20 (11.4 %)
3∼4 units	85 (48.5 %)	$60-$100	78 (44.0 %)
Over 5 units	29 (16.4 %)	$100-$125	58 (33.1 %)
		Over $125	20 (11.4 %)
Treatment fee (adult)		**Fee of TADs**	
Under $3.2T	22 (12.4 %)	Included	55 (31.0 %)
$3.2T - $5T	140 (79.4 %)	Under $150	58 (32.7 %)
$5T - $6.5T	14 (8.2 %)	$150 -$300	62 (35.7 %)
Over $6.5T	0 (0 %)	Over $300	1 (0.6 %)

*Unit = 3 h; $: United States dollar; TADs: temporary anchorage devices.

except in age. 60 % of the respondents were practicing in northern Taiwan, and 70 % worked in clinics.

Orthodontic practice profiles 33.7 % of the respondents had their own practices, whereas 66.3 % were employed in clinics (Table 2). Of the orthodontists, 81.1 % worked for >6 clinic units (1 unit = 3 h) per week and 64.9 % worked for >3 units in the evenings. Regarding treatment cost, 79.4 % of the orthodontists charged between $3200 and $4800 for orthodontic treatment in adults. For TADs, 32.7 % of the orthodontists charged less than $150, 35.7 % charged between $150 and $300, and 31 % included the TADs cost in the treatment cost.

Orthodontic patient profiles

Among the orthodontists, 39.0 %, 28.5 %, 14.5 %, and 12.8 % managed <50, 51–100, 101–200, and >201 cases every year, respectively (Table 3). 56.9 % of the orthodontists reported that >50 % their patients accepted the recommended treatment plans. Class I and Class II malocclusions were the most common orthodontic problems; 68.2 % and 41.9 % of the orthodontists reported that >50 % of their patients had Class I or Class II malocclusion, respectively. However, the prevalence of Class III malocclusion was relatively low, with 5.8 % of the orthodontists reporting >50 % of their patients. Furthermore, 72.4 % of the orthodontists indicated that <25 % of their patients were children seeking two-phase orthodontic treatment. 68.2 % of the orthodontists reported that >50 % of their patients were women.

Orthodontic mechanisms

Of the orthodontists, 42.4 % never treated their patients using invisible aligners (Table 4). 80.7 % of the orthodontists preferred the sliding mechanism for closing spaces, whereas 13.9 % preferred the loop mechanism. Furthermore, 51.7 % and 83 % of the orthodontists reported that >50 % of their patients required tooth extraction or TADs placement, respectively. Interdisciplinary treatment in collaboration with oral surgeons and temporomandibular disorder specialists was less common. 12.8 % and 43.5 % of the orthodontists always used the 0.018 and 0.022 bracket slot systems, respectively.

Correlation between demographic and practice profiles Table 5 presents the Pearson correlation coefficients between demographic and practice profiles. A positive correlation was observed between the age of the orthodontists and the number of patients they treated per day. For female orthodontists, positive correlations were noted with various aspects of practice—for example, the use of TADs and the frequency of visits. Furthermore, practice location influenced the cost of TADs. The daily patient volume was higher for orthodontists in hospitals than for those in clinics.

As shown in Table 6, the cost of TADs was significantly influenced by the sex ($P = 0.007$) and practice location ($P = 0.012$) of the orthodontists. TADs use was significantly and positively correlated with sex ($P = 0.005$) and clinical frequency ($P = 0.031$). Daily patient volume was significantly and positively associated with age ($P = 0.000$) but negatively associated with institution type ($P = 0.003$). Sex and clinical frequency significantly influenced the frequency of patient visits ($P = 0.005$). Furthermore, sex was significantly associated with the rate of patient acquisition, clinical time spent during each visit, and management of adult and female patients.

Discussion

Our findings revealed differences in demographic and practice profiles of orthodontists between Taiwan and other countries. Our cohort was younger than the TAO members in 2023. Only 5.2 % of the respondents were aged >60 years. By contrast, 16.2 % of the TAO members in 2023 were aged >60 years. Age-related comparisons may affect interpretation of our results and should be approached with caution; this is a limitation of our study. Regarding clinical frequency, 72.5 % of the respondents reported working approximately 7–12 units per week (1 unit = 3 h), which is consistent with findings from other similar studies.[5]

The cost of orthodontic treatment for adults in Taiwan ranges from $3200 to $4800. According to the 2021 Journal of Clinical Orthodontics (JCO) survey, the median costs of orthodontic treatment for adults and children in the United States were $6200 and $5,750, respectively. The between-country differences in treatment cost may be attributable to factors such as time, inflation, exchange rates, and national conditions.[6–8] For example, in 2022, the average disposable income was $19,200 in Taiwan and $48,600 in the United States.[9] In Japan, South Korea, and New Zealand, the costs of orthodontic treatment range from $5000 to $8000. In China, this cost ranges from $1500 to $2400. In India, the cost of orthodontic treatment is $350, which is significantly lower than that in other countries.[10] These differences may be attributable to national circumstances and consumer price indexes.

Table 3 Orthodontic patient profiles.

Respondents	People (%)	Respondents	People (%)
New case accepted rate		**Transferred case (from GP)**	
0～25 %	15 (8.6 %)	0～25 %	77 (44 %)
26～50 %	39 (22.4 %)	26～50 %	59 (33.3 %)
51～75 %	66 (37.4 %)	51～75 %	28 (15.5 %)
76～100 %	34 (19.5 %)	76～100 %	12 (7.1 %)
Not calculated	22 (12.1 %)		
Two-phase treatment rate in children		**Transferred case (from specialist)**	
0～25 %	127 (72.4 %)	0～25 %	128 (72.5 %)
26～50 %	25 (14.4 %)	26～50 %	34 (19.2 %)
51～75 %	7 (4 %)	51～75 %	11 (6 %)
76～100 %	3 (1.7 %)	76～100 %	3 (2.4 %)
Not calculated	14 (7.5 %)		
Male case		**Transferred case (from patient)**	
0～25 %	38 (21.4 %)	0～25 %	49 (27.6 %)
26～50 %	91 (51.4 %)	26～50 %	57 (32.4 %)
51～75 %	19 (11 %)	51～75 %	55 (31.2 %)
76～100 %	1 (0.6 %)	76～100 %	15 (8.8 %)
Not calculated	27 (15 %)		
Female case		**Patient number per year**	
0～25 %	3 (1.7 %)	Under 50	69 (39.0 %)
26～50 %	23 (13.3 %)	51～100	50 (28.5 %)
51～75 %	97 (54.9 %)	101～200	26 (14.5 %)
76～100 %	23 (13.3 %)	Over 200	9 (5.2 %)
Not calculated	30 (16.8 %)	Not calculated	22 (12.8 %)
Class I case		**Frequency of return visit**	
0～25 %	3 (1.7 %)	Every 2 Weeks	16 (9.1 %)
26～50 %	23 (13.3 %)	Every 3 weeks	35 (19.7 %)
51～75 %	97 (54.9 %)	Every 4 weeks	108 (61.1 %)
76～100 %	23 (13.3 %)	Over 4 weeks	17 (10.7 %)
Not calculated	30 (16.8 %)		
Class II case		**Duration of each visit**	
0～25 %	25 (14 %)	Under 15 min	19 (11.0 %)
26～50 %	74 (41.9 %)	15—30 min	130 (74.0 %)
51～75 %	32 (18 %)	30—45 min	22 (12.7 %)
76～100 %	3 (1.7 %)	45—60 min	5 (2.3 %)
Not calculated	42 (24.4 %)	over 60 min	0 (0 %)
Class III case		**Number of assistants**	
0～25 %	76 (43.9 %)	0	12 (7.0 %)
26～50 %	47 (27.2 %)	1～2	147 (83.6 %)
51～75 %	9 (5.2 %)	Over 3	17 (9.4 %)
76～100 %	1 (0.6 %)		
Not calculated	40 (23.1 %)		

GP: general practice dentists

Our survey revealed that >50 % of the orthodontists in Taiwan treated <100 patients annually. However, according to the 2021 JCO survey, an average of 520 patients seek orthodontic treatment every year.[6–8] Orthodontics has gained popularity in Taiwan over 3 decades. By contrast, the United States has a century-long history of orthodontic practice. This discrepancy likely contributed to the between-country differences in the average annual number of patients seeking orthodontic treatment. As Taiwan's gross domestic product improves, the number of patients is expected to increase. Regarding sex, female patients are generally more likely than male patients are to seek orthodontic treatment, possibly because of the influence of social media. These findings are consistent with the those of the 2021 JCO survey.[6–8]

Our survey revealed that the proportion of pediatric patients was relatively low, with 72.4 % of the orthodontists reporting that only 0%—25 % of their patients were children. This trend may be attributable to the fact that many pediatric dentists in Taiwan provide early orthodontic care, which results in a divided market. By contrast, the proportions of children and adolescents seeking orthodontic treatment in the United States are higher than that of adults, possibly because of an increased emphasis on children's oral

Table 4 Orthodontic mechanisms.

Respondents	People (%)	Respondents	People (%)
Invisible aligners		**Treatment combined with OGS**	
Never 0 %	75 (42.4 %)	Never 0 %	24 (14 %)
Seldom 25 %	77 (43.6 %)	Seldom 25 %	99 (56.4 %)
Sometimes 50 %	17 (9.9 %)	Sometimes 50 %	44 (25 %)
Usually 75 %	4 (2.3 %)	Usually 75 %	8 (4.7 %)
Always 100 %	3 (1.7 %)	Always 100 %	0 (0 %)
Loop mechanism for space closure		**Treatment combined with TMD**	
Never 0 %	23 (12.8 %)	Never 0 %	46 (25.9 %)
Seldom 25 %	80 (45.3 %)	Seldom 25 %	91 (51.8 %)
Sometimes 50 %	49 (27.9 %)	Sometimes 50 %	35 (19.9 %)
Usually 75 %	21 (12.2 %)	Usually 75 %	3 (1.7 %)
Always 100 %	3 (1.7 %)	Always 100 %	1 (0.6 %)
Sliding mechanism for space closure		**Orthodontic appliances by CAD/CAM**	
Never 0 %	1 (0.6 %)	Never 0 %	129 (73.1 %)
Seldom 25 %	14 (8.2 %)	Seldom 25 %	32 (18.1 %)
Sometimes 50 %	18 (10.5 %)	Sometimes 50 %	8 (4.7 %)
Usually 75 %	105 (59.6 %)	Usually 75 %	6 (3.5 %)
Always 100 %	37 (21.1 %)	Always 100 %	1 (0.6 %)
Orthodontic extraction		**Using .018 bracket system**	
Never 0 %	2 (1.2 %)	Never 0 %	78 (44.2 %)
Seldom 25 %	8 (4.7 %)	Seldom 25 %	35 (19.8 %)
Sometimes 50 %	74 (41.9 %)	Sometimes 50 %	7 (4.1 %)
Usually 75 %	91 (51.7 %)	Usually 75 %	34 (19.2 %)
Always 100 %	1 (0.6 %)	Always 100 %	23 (12.8 %)
TADs usage		**Using .022 bracket system**	
Never 0 %	1 (0.6 %)	Never 0 %	17 (9.9 %)
Seldom 25 %	29 (16.4 %)	Seldom 25 %	29 (16.3 %)
Sometimes 50 %	65 (36.8 %)	Sometimes 50 %	12 (7 %)
Usually 75 %	73 (41.5 %)	Usually 75 %	38 (21.5 %)
Always 100 %	8 (4.7 %)	Always 100 %	80 (45.3 %)

OGS: Orthognathic surgery; TMD: Temporomandibular joint disorder; CAD/CAM: Computer-aided design and computer-aided manufacturing

Table 5 Pearson correlation between demographic and practice profiles.

	Age *r* (*P*)	Gender *r* (*P*)	Area in Taiwan *r* (*P*)	Institution *r* (*P*)	Clinical frequency *r* (*P*)
Treatment fee (adult)					
Treatment fee (children)					
TADs fee			0.214 (0.005**)		0.155 (0.041*)
TADs usage		0.181 (0.017*)			
Total patient numbers per year					
New patient per year					
New active cases accept rate		0.176 (0.020*)			
Patient numbers per day	0.252 (0.001**)			−0.167 (0.027*)	
Patient visit frequency		0.180 (0.017*)			0.171 (0.024*)
Clinical time in every visit		0.171 (0.023*)			
Adult cases		0.156 (0.039*)			
Child cases					
Two-phase treatment rate in children's cases					
Male cases					
Female cases		0.164 (0.031*)			
Class I cases					
Class II cases					
Class III cases					

*Significant difference ($P < 0.05$); **highly significant difference ($P < 0.005$)

Table 6 Multiple linear regression between demographic and practice profiles.

	Age β (*P*)	Gender β (*P*)	Area in Taiwan β (*P*)	Institution β (*P*)	Clinical frequency β (*P*)
TADs fee	0.102 (0.124)	0.356 (0.007*)	0.102 (0.012*)	−0.109 (0.412)	0.131 (0.052)
TADs usage	0.048 (0.501)	0.398 (0.005*)	0.007 (0.879)	0.142 (0.320)	0.157 (0.031*)
New active cases accept rate	0.144 (0.101)	0.473 (0.007*)	0.042 (0.434)	−0.264 (0.136)	−0.010 (0.909)
Patient numbers per day	0.388 (0.000**)	0.250 (0.182)	−0.052 (0.370)	−0.568 (0.003**)	−0.020 (0.836)
Patient visit frequency	−0.020 (0.701)	0.282 (0.005*)	−0.001 (0.962)	−0.056 (0.588)	0.146 (0.005*)
Clinical time in every visit	0.035 (0.457)	0.238 (0.012*)	−0.013 (0.663)	−0.081 (0.399)	0.047 (0.328)
Adult cases	0.004 (0.957)	0.283 (0.058)	−0.011 (0.814)	0.096 (0.527)	−0.011 (0.882)
Female cases	0.025 (0.752)	0.360 (0.022*)	0.044 (0.367)	−0.083 (0.601)	0.060 (0.459)

Standardized coefficient β values and P values are reported in the table.
*$P < 0.05$ indicates that standardized coefficient β values are statistically significant**$P < 0.005$ indicates that standardized coefficient β values are highly statistically significant.

health and malocclusions; allowing severe dental decay in children is even regarded as a form of abuse in the United States.[11]

According to a systematic review, the prevalence of Class III malocclusion is lower in Caucasian (3%—5%) than in East Asian individuals (14 % in the Japanese and 15.69 % in the Chinese).[12] A retrospective study reported that the prevalence of Class I, Class II, and Class II malocclusions in Taiwan was 39.3 %, 30.8 %, and 29.9 %, respectively. 43.9 % of our respondents reported that 0%—25 % of their patients had Class III malocclusion.[13] This finding aligns with that of the retrospective study.

Regarding patient acquisition, 40 % of the orthodontists indicated that >50 % of their patients were referred by other patients. Referrals from general practice dentists were the second most common, and referrals from other specialists were less common. These findings indicate that word of mouth plays a pivotal role in the acquisition of patients. Because social media was not widely used when this study was designed, future surveys should explore the effect of social media. According to the JCO survey, although Facebook is the most used external marketing tool, paid online advertising is more effective than social media.[7]

Aligners have become more common over time; however, 42.4 % of our respondents reported not using aligners for treatment. Aligners represent an auxiliary mechanism of orthodontic treatment, not the primary mechanism, and limitations of aligners prevent orthodontists from relying exclusively on these. Meade et al. (2022) found that 93.1 % of all Australian orthodontists used aligners for treatment but 63.7 % did not use them in patients requiring extraction; 71.4 % of the orthodontists stated that fixed appliances led to improved outcomes in these patients.[14] In France, 48.1 % of all orthodontists treat 21—100 patients every year; however, only a median of 5 patients are treated with aligners. These findings highlight the limitations of aligner-based treatment.[14] Fixed appliances are still required to resolve various problems; this has led to aligner being unpopular among specialists in Taiwan.

Although the 0.018 and 0.022 bracket slot systems do not differ significantly in terms of tooth movement speed or treatment outcomes,[15] most Taiwanese orthodontists (66.8 %) prefer the 0.022 system. This finding is consistent with trends observed in several countries.

Our survey revealed that >50 % of patients in Taiwan required extraction. A study conducted in Taipei Medical University Hospital reported that the average proportion of patients requiring extraction was 51.7 % in 2003—2005.[16] However, evidence from Western countries suggests that 70%—85 % and 85%—90 % of patients in the United States and Australia, respectively, do not require extraction.[17] The primary reason for the discrepancy between Taiwan and Western countries is that Western individuals tend to seek orthodontic treatment for even minor misalignments, resulting in a low proportion of extraction cases.

46.2 % of our respondents usually used TADs for anchorage during treatment. However, a study conducted by the Asian Pacific Orthodontic Society in 2020 reported that TADs were less popular in Western countries (e.g., United States and Canada) than in Asian countries; only 3 % of all German orthodontists inserted TADs by themselves.[17] In Taiwan, orthodontic cases often involve severe crowding and bimaxillary protrusion, which explains the high prevalence of extraction and the need for TADs.[18]

As presented in Tables 5 and 6, significant between-sex differences were observed such as clinical decision-making. Female orthodontists may have a stronger preference for less protrusive lip profiles compared to their male counterparts. As a result, they are more likely to incorporate the use of TADs in their treatment plans to achieve greater anterior retraction, leading to more significant improvements in facial aesthetics. Although some regional differences were noted within Taiwan, the only factor that was strongly associated practice location was the cost of TADs. According to the Department of Budget, Accounting and Statistics, the disposable income in 2022 was $20,300 in northern Taiwan, $17,900 in central Taiwan, $16,600 in southern Taiwan, and $16,300 in the Eastern Island. These reflect the regional differences in economic conditions and medical costs.

The type of institution where an orthodontist practice influences daily patient volume. Hospitals often function as teaching institutions, where treatments are provided by trainee orthodontists. Thus, the daily patient volume is higher for hospitals than for private clinics.[19] Clinical frequency is correlated with the cost and use of TADs and the frequency of visits. These findings clarify the trends in orthodontic practice and offer valuable insights for

policymaking and professional development. Notably, factors such as orthodontic treatment cost and patient volume exhibited no clear correlations with age, sex, or practice location. Therefore, these factors may be influenced by other variables, such as market environment and clinic policies. Further research is required to explore these aspects.

This study has some limitations. The age of the respondents in the sample was lower than that of the general population. Future studies should consider adjusting their questionnaire design and distribution methods to include more experienced orthodontists. Additionally, while the questionnaire was collected in 2018, the population data was based on 2023 standards. We re-conducted a goodness-of-fit test analysis using the 2018 data and found no significant differences compared to 2023. This shows that the demographic of TAO has no change over this period. Despite the limitation, this study provides valuable insights into the practice profiles of orthodontists in Taiwan. These insights can help new practitioners understand market conditions and can inform policymaking by relevant authorities. Future studies should continue to track and analyze the practice profiles in Taiwan.

In conclusion, this study is the first to explore the practice profiles of orthodontists in Taiwan. The use of TADs is relatively high in Taiwan, likely because of aggressive marketing, which can lead to the overuse of these devices. Most patients are referred by other patients, which highlights the importance of word of mouth in patient referral for orthodontic care. Despite extensive efforts by companies to promote invisible aligners, the use of these tools remains limited because of the limitations of aligners. Significant regional differences were noted in the distribution of orthodontists within Taiwan; orthodontic practices were concentrated in some regions. We recommend to focus on enhancing education and training programs to improve healthcare quality, reduce urban-rural disparities, and increase access to orthodontic care for the population.

Declaration of competing interest

The authors have no conflicts of interest relevant to this article.

Acknowledgments

The authors are grateful to the staff of the Taiwan Association of Orthodontists.

References

1. Keim RG, Gottlieb EL, Nelson AH. JCO orthodontic practice study: part 1 trends. *J Clin Orthod* 2015;10:625—39.
2. Keim RG, Gottlieb EL, Nelson AH. JCO orthodontic practice study: part 2 practice success. *J Clin Orthod* 2015;11:685—95.
3. Eto LF, Andrade V. The orthodontist's profile in Minas Gerais. *Dental Press J Orthod* 2012;17:1—9.
4. Mathew R, Spencer AJ. Orthodontic practices in Australasia: practice activity. *Aust Orthod J* 2005;21:1—10.
5. Lewis BR, Spicer OJ, McLaughlin WS, et al. Survey of national health service (NHS) orthodontic practitioners in wales, UK. Part 1: working patterns 2021—2022. *J Orthod* 2024;51:137—46.
6. Keim RG, Vogels Iii DS, Vogels PB. 2021 JCO orthodontic practice study: part 1 trends. *J Clin Orthod* 2021;55:591—606.
7. Keim RG, Vogels Iii DS, Vogels PB. 2021 JCO orthodontic practice study: part 2 practice success. *J Clin Orthod* 2021;55:657—74.
8. Keim RG, Vogels Iii DS, Vogels PB. 2021 JCO orthodontic practice study: part 3 practice growth and staff data. *J Clin Orthod* 2021;55:725—38.
9. Huang HC, Hung PH, Hung CF, et al. Spatial spillover effects of fiscal expenditure and economic opportunity on internal migration in Taiwan. *Asian Pac Migrat J* 2024;33:162—90.
10. Tanne K. Current status of orthodontic professionals in the Asian Pacific region. *APOS Trends Orthod* 2016;6:58—77.
11. Sillevis Smitt H, de Leeuw J, de Vries T. Association between severe dental caries and child abuse and neglect. *J Oral Maxillofac Surg* 2017;75:2304—6.
12. Hardy DK, Cubas YP, Orellana MF. Prevalence of angle class III malocclusion: a systematic review and meta-analysis. *Open J Epidemiol* 2012;2:75—82.
13. Tsai ZZ, Chang M, Tseng YC. Distribution of different skeletal and dental relations among orthodontic patients in recent 5 years: a retrospective study. *Taiwan J Orthod* 2023;35:128—35.
14. Meade MJ, Weir T. A survey of orthodontic clear aligner practices among orthodontists. *Am J Orthod Dentofacial Orthop* 2022;162:302—11.
15. El-Angbawi AM, Yassir YA, McIntyre GT, et al. A randomized clinical trial of the effectiveness of 0.018-inch and 0.022-inch slot orthodontic bracket systems: part 3-biological side-effects of treatment. *Eur J Orthod* 2019;41:154—64.
16. Cheng HC, Chen CH, Hsieh TT. Analysis of orthodontic extraction frequencies at Taipei medical university hospital. *Taiwan J Orthod* 2008;20:33—40.
17. Tanne K. Current status of clinical orthodontics in European and American countries. *APOS Trends Orthod* 2020;10:204—23.
18. Cheng HC, Chen DS, Tan Y, et al. Factors associated with usage frequency and pricing of temporary anchorage devices among orthodontists. *J Dent Sci* 2024;19:404—10.
19. Chang JY, Tsai SJ, Lin TC, et al. Current practice patterns and training project of orthodontic specialists in Taiwan in 2020. *J Dent Sci* 2021;16:1087—94.