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Dentists' Knowledge, Attitude and Practice To China's Centralized Dental Implants Procurement: A Cross-sectional Study

Ting Xiao
Hunan University of Traditional Chinese Medicine
Yanjun Ma
Qinghai Institute of Health Science
Zhenyu Yang
Hunan University of Traditional Chinese Medicine
Zi Xiang
Hunan University of Traditional Chinese Medicine
Lingling Gong
Hunan University of Traditional Chinese Medicine
Yixuan Hou
Hunan University of Traditional Chinese Medicine
Weijuan Jiang
Hunan University of Traditional Chinese Medicine
Bo Feng
Hunan University of Traditional Chinese Medicine
Ming Li
liming@hnucm.edu.cn

Hunan University of Traditional Chinese Medicine

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Abstract

Background

The Chinese government implemented the National Centralized Dental Implants Procurement (NCDIP) policy in September 2022 to enhance the accessibility and quality of dental services and to support the sustainable development of the dental implant industry. In this study, dentists' knowledge, attitudes, and practices (KAP) regarding the NCDIP were assessed; the implementation of the policy was evaluated; factors influencing KAP were identified; and recommendations were proposed to inform policy refinement and enforcement.

Methods

A cross-sectional study was conducted in China between May and June 2023 to assess licensed dentists' knowledge, attitudes, and practices regarding the NCDIP policy using an online survey. Logistic regression analyses were performed to identify factors associated with dentists' KAP.

Results

A total of 1,153 dentists completed the survey. Overall, 97.79% of respondents reported awareness of the NCDIP policy, and 71.18% reported being familiar with it. Female dentists demonstrated a higher level of understanding of the policy than male dentists. Among respondents, 79.53% believed that the NCDIP policy could influence healthcare reform, and 75.04% agreed that its implementation was reasonable and could reduce the cost of dental implants. Additionally, 69.32% of dentists believed that the policy could reduce the economic burden on patients, with dentists working in private hospitals reporting stronger perceptions of the policy's impact. Regarding practice, 88.2% of dentists reported prioritizing centrally procured implants, 90.8% reported actively seeking information about the policy, and 90.8% reported actively promoting the policy to patients. Furthermore, 80.14% indicated that they or their family members would choose implants procured through national centralized purchasing. Higher educational attainment was associated with a greater likelihood of choosing centralized procurement, while employment in private hospitals was associated with increased willingness to learn about and promote the policy.

Conclusions

Overall, most dentists demonstrated adequate understanding of and support for the NCDIP policy; however, further efforts are required to strengthen its promotion and enforcement, particularly in public hospitals, to ensure consistent adherence.

Background

Oral diseases represent a major global health burden and remain among the most prevalent public health problems worldwide [1]. The Fourth National Oral Health Survey in China revealed suboptimal oral hygiene conditions, indicating an urgent need for improvement [2]. Dental implants are widely regarded as one of the most significant innovations in contemporary dentistry [3], and oral rehabilitation is increasingly achieved through dental implant placement, reflecting the growing demand among patients and practitioners for aesthetically pleasing, functionally effective, minimally invasive, and durable treatment solutions [4]. However, the high cost of dental implant treatment has emerged as a major barrier preventing patients from receiving appropriate care [5, 6]. Long-standing issues related to non-standardized fees and substantial financial burden have persisted in dental implant services, and these challenges have been further exacerbated by population aging and rising expectations for oral healthcare. Therefore, reducing the cost of dental implant treatment and establishing reasonable pricing are essential for improving access to oral healthcare and safeguarding population oral health.Controlling the prices of high-value medical consumables has become a key component of healthcare system reform in China. In January 2022, the Chinese State Council approved the expansion of centralized procurement to include high-value medical consumables, explicitly identifying dental implants as a priority category. Subsequently, in September 2022, the National Healthcare Security Administration issued regulations to standardize dental implant service fees and consumable prices, thereby strengthening price control measures. These initiatives aimed to implement centralized procurement and comprehensive fee management across both public and private healthcare institutions.

Previously, centralized procurement had been implemented in China for selected pharmaceuticals, resulting in substantial reductions in drug prices [7]. Price linkage mechanisms also contributed to price reductions among non-selected drugs, thereby alleviating the financial burden on patients, particularly those with chronic or severe conditions [8]. Medical device technology represents a strategically important sector, and public procurement has been recognized as an effective policy instrument for regulating this market. Historically, various European countries have adopted multiple approaches to control medical device prices, including reference pricing, negotiated discounts, price caps, and centralized procurement [9]. As procurement practices in the healthcare sector have expanded, many governments have achieved substantial price reductions [10].

The National Centralized Dental Implants Procurement (NCDIP) policy has been implemented in several regions of China, resulting in marked reductions in dental implant prices. However, whether the NCDIP can achieve its intended clinical and practical outcomes in routine medical services, and how it is perceived by dentists, remain unclear and warrant comprehensive investigation.

The knowledge–attitude–practice (KAP) model posits that knowledge and information form the foundation for the development of positive beliefs and attitudes, which in turn promote health-related behaviors, while attitudes and beliefs serve as key drivers of behavioral change [11]. To date, limited research has examined dentists' knowledge, attitudes, and practices regarding the National Centralized

Dental Implants Procurement (NCDIP) policy. Therefore, this study aimed to assess dentists' understanding and implementation of the NCDIP policy in China, with the objective of informing policy optimization and implementation strategies.

Methods and materials

Study Design

This study employed a cross-sectional design using a questionnaire survey to assess dentists across multiple regions in China. Stratified random sampling was applied to recruit participants from large metropolitan areas (Beijing, Shanghai, Guangzhou, and Shenzhen), medium-sized urban areas (Qingdao, Chengdu, Hangzhou, and Changsha), and small urban areas (Yantai, Deyang, Quzhou, and Xiangtan). In each region, dentists were randomly selected from two tertiary hospitals, two secondary hospitals, two primary hospitals, and two private hospitals. The survey was conducted from May to June 2023.

Sample Size

Based on a prior study reporting 62.5% awareness of centralized drug procurement, the minimum required sample size was calculated as 603 (α=0.05, power=90%). A total of 1,180 dentists participated, with 1,153 valid responses included (valid rate: 97.79%).

Questionnaire design

The questionnaire was developed with reference to previously published surveys on national centralized drug procurement. Following an extensive literature review and discussions with three clinical dentists, and considering the current status of the domestic dental implant industry, the questionnaire underwent multiple rounds of revision and refinement. The questionnaire was designed to be concise and clear, with standardized wording and ease of completion. Content validity was evaluated by three experts in the field of dentistry. Prior to the formal survey, a pilot study was conducted to assess the reliability and validity of the questionnaire.

The questionnaire, based on the knowledge–attitude–practice (KAP) framework, consisted of 22 mandatory single-choice items and two multiple-choice items and was structured into five sections: (1) dentists' characteristics, including profession, education level, and years of work experience; (2) knowledge, assessing familiarity with the NCDIP policy using a 5-point Likert scale (1 = "very unfamiliar" to 5 = "very familiar") and sources of policy information; (3) attitudes, assessing perceptions of the policy's impact using a 5-point Likert scale (1 = "strongly disagree" to 5 = "strongly agree"); and (4) practices, assessing policy interpretation, patient guidance, and dental implant selection using a 5-point Likert scale, with higher scores indicating stronger engagement[12]. Detailed information on the KAP questionnaire is provided in the Supplementary Material.

Data collection

Data were collected using stratified random sampling. The questionnaire was distributed via the Questionnaire Star platform, and participants completed the survey by scanning a WeChat QR code. The study purpose and completion instructions were clearly provided to ensure response quality. Responses from completed questionnaires were automatically recorded on the Questionnaire Star platform. Questionnaires containing multiple selections for single-choice items, missing responses, logical inconsistencies, or completion times of less than 1 minute were deemed invalid and excluded from the analysis.

Statistical analysis

Statistical analyses were performed using IBM SPSS Statistics version 22.0 software. Categorical variables were summarized as frequencies and percentages. Univariate logistic regression analysis was conducted to examine factors associated with levels of knowledge, attitudes, and practices (KAP). Variables with a p value < 0.05 in univariate analyses were included as covariates in the multivariate logistic regression models to identify factors independently associated with KAP levels. A two-sided p value < 0.05 was considered statistically significant.

Results

Study Population Characteristics

The characteristics of the study population are presented in Table 1. A total of 1,180 dentists participated in the questionnaire survey. Seventeen questionnaires were incomplete, and ten contained logical inconsistencies. Ultimately, 1,153 dentists were included in the statistical analysis, yielding an overall questionnaire response validity rate of 97.79%. Most participants were aged 20–30 years (56.67%). Of the respondents, 385 (33.36%) were from large metropolitan areas, 388 (33.62%) were from medium-sized urban areas, and 380 (32.93%) were from small urban areas.

Dentists’ knowledges about the NCDIP policy

Overall, 95.67% of dentists were aware of the NCDIP policy, and 71.18% reported being familiar with it. The primary source of information was hospital disclosure materials (Supplementary Table 1).

Dentists’ attitudes about the NCDIP policy

Overall, dentists demonstrated generally positive attitudes toward the NCDIP policy. Specifically, 79.53% of respondents agreed that the policy plays a significant role in national healthcare reform. In addition, 75.04% agreed that its implementation was reasonable and could reduce the cost of dental implants. Furthermore, 69.32% believed that the policy could reduce the economic burden on patients. However, only 68.66% agreed that the policy could effectively reduce doctor–patient disputes.

Dentists’ practice about the NCDIP policy

With respect to clinical practice, 88.2% of dentists reported prioritizing centrally procured implants during clinical treatment. In addition, 90.8% reported actively seeking information about the national centralized dental implant procurement policy, and 90.8% reported actively promoting the NCDIP policy to patients. Furthermore, 80.14% indicated that they and their family members would choose nationally centrally procured implants.However, given the recent implementation of the policy, some concerns were reported. Specifically, 59.27% of dentists were concerned that limitations in brand selection might affect clinical diagnosis and treatment, and 34.84% expressed concerns regarding limited clinical use duration and uncertainty about long-term efficacy.

Factors associated with knowledge level

Multivariate logistic regression analysis revealed that dentists from medium and small urban areas, those aged 31–55 and over 55, and those with intermediate professional titles demonstrated significantly higher levels of policy knowledge (Table 2).

Factors associated with attitude level

Attitudes were assessed across three domains: impact on healthcare reform, reduction of patients' economic burden, and reduction of doctor–patient disputes. Overall, 878 dentists (79.53%) believed that the policy could have a significant impact on healthcare reform, whereas 226 (20.47%) did not. Multivariate logistic regression analysis indicated that gender, education level, professional title, and hospital category were significantly associated with attitudes toward healthcare reform. Specifically, female dentists were more likely to believe that the policy would have a significant impact compared to males (OR=2.59, 95% CI: 1.82–3.72). In contrast, dentists with a master's degree or above were less likely to hold this belief than those with education below bachelor's degree (OR=0.44, 95% CI: 0.24–0.81). Similarly, dentists with senior professional titles were less likely to believe in a significant impact compared to those with primary titles (OR=0.36, 95% CI: 0.18–0.70), and those working in private hospitals were less likely than those in tertiary hospitals (OR=0.48, 95% CI: 0.32–0.71) (Table 3.1).

Regarding reduction of the economic burden on patients, 986 dentists (89.31%) believed that the NCDIP policy could reduce patients' economic burden. Multivariate logistic regression analysis showed that dentists aged 31–55 years were less likely to agree with this view (OR = 0.39, 95% CI: 0.19–0.81), while female dentists were more likely to agree (OR = 1.78, 95% CI: 1.15–2.81). In contrast, dentists working in private hospitals (OR = 0.57, 95% CI: 0.34–0.95) were less likely to agree that the policy could reduce patients' economic burden. Additionally, dentists in medium-sized urban areas (OR = 2.98, 95% CI: 1.72–5.26) and small urban areas (OR = 4.37, 95% CI: 2.41–8.19) were more likely to agree with this view compared to those in large metropolitan areas (Table 3.2).

Regarding reduction of doctor–patient disputes, 758 dentists (68.66%) believed that the centralized procurement policy could reduce such disputes, whereas 346 (31.34%) did not. Multivariate logistic regression analysis indicated that dentists with a master's degree or higher (OR = 0.47, 95% CI: 0.27–0.79), those with 10–20 years of work experience (OR = 0.56, 95% CI: 0.38–0.84), and those working in

private hospitals (OR = 0.50, 95% CI: 0.35–0.71) were less likely to agree that the policy could reduce doctor–patient disputes. In contrast, female dentists were more likely to agree with this view (OR = 1.95, 95% CI: 1.46–2.64) (Table 3.3).

Factors associated with practice level

Practices were assessed across three domains: prioritization of centrally procured dental implants, proactive acquisition of policy-related information, and proactive promotion of the policy to patients. Overall, 974 dentists (88.2%) reported prioritizing centrally procured implants during clinical treatment.

Multivariate logistic regression analysis showed that dentists working in primary hospitals (OR = 0.41, 95% CI: 0.21–0.84) and private hospitals (OR = 0.45, 95% CI: 0.27–0.75) were less likely to prioritize the use of centrally procured dental implants. In contrast, dentists in medium-sized urban areas (OR = 1.72, 95% CI: 1.01–2.96) and small urban areas (OR = 2.41, 95% CI: 1.38–4.29) were more likely to prioritize their use compared to those in large metropolitan areas (Table 4.1).

Regarding proactive acquisition of policy-related information, 1003 dentists (90.8%) reported actively seeking information about the national centralized dental implant procurement policy. Multivariate logistic regression analysis indicated that female dentists were more likely to proactively seek information about the policy (OR = 2.08, 95% CI: 1.31–3.42). Additionally, dentists in medium-sized urban areas (OR = 3.12, 95% CI: 1.72–5.78) and small urban areas (OR = 4.72, 95% CI: 2.54–9.13) were more likely to proactively seek information compared to those in large metropolitan areas (Table 4.2).

Regarding proactive promotion of the policy to patients, 1003 dentists (90.8%) reported actively promoting the NCDIP policy. Multivariate logistic regression analysis showed that dentists working in primary hospitals were less likely to proactively promote the policy (OR = 0.47, 95% CI: 0.25–0.92). In contrast, dentists in medium-sized urban areas (OR = 5.01, 95% CI: 2.60–10.16) and small urban areas (OR = 4.20, 95% CI: 2.25–8.19) were significantly more likely to promote the policy compared to those in large metropolitan areas (Table 4.3).

Discussion

In this study, a comprehensive investigation was conducted to examine dentists' knowledge, attitudes, and practices regarding the NCDIP policy. The NCDIP represents a unique policy initiative in China aimed at improving access to dental implant services and promoting the standardized and sustainable development of the dental implant industry through price regulation and centralized procurement. As key stakeholders in policy implementation, dentists' attitudes and behaviors play a critical role in determining the effectiveness of the NCDIP policy[13]. Accordingly, this study evaluated dentists' responses to the policy across three dimensions—knowledge, attitudes, and practices—providing important empirical evidence for assessing policy implementation and identifying factors that may influence its effectiveness.

With respect to policy awareness, 95.67% of dentists were aware of the NCDIP policy, and 71.18% reported being familiar with it. Hospital disclosure was identified as the primary source of information, suggesting that the policy has been effectively disseminated among dentists and is generally well accepted. Notably, compared with previous reports on centralized drug procurement policies, dentists demonstrated a higher level of awareness of the centralized dental implant procurement policy, indicating improved policy communication and engagement within the dental profession.[14]

A positive attitude among dentists is considered an important driving force for the effective implementation of the NCDIP policy. At the attitudinal level, our study showed that most dentists believed the policy could reduce patients' economic burden, alleviate doctor–patient disputes, and exert a significant impact on healthcare reform. Compared with its perceived effects on healthcare reform and doctor–patient relationships, a greater proportion of dentists regarded the policy as having a more direct impact on reducing patients' financial burden.

Price reduction represents a direct consequence of policy implementation and is a key factor influencing patients' willingness to receive dental implant treatment [15]. Previous studies have reported that many patients are unwilling to accept the prevailing market price of dental implants [16]. Consistent with these findings, evidence indicates that dental implant prices have decreased substantially since the implementation of centralized procurement policies [17]. Before centralized procurement, the average price of domestic dental implants in 2020 was approximately 10,616 yuan per unit; following policy implementation, the average price decreased to about 5,867 yuan, representing a reduction of nearly 45% [18]. Such comprehensive price regulation may lower financial barriers to care, thereby increasing access to dental implant treatment for patients who were previously deterred by high costs [19].

Notably, our results indicated that dentists working in private hospitals showed a lower level of agreement regarding the policy's ability to reduce patients' economic burden. A possible explanation is that dental implant prices in private hospitals were generally higher prior to policy implementation, and residual costs may remain relatively elevated even after price reductions, thereby attenuating dentists' perceived benefits of the policy in these settings.

An increase in knowledge level is known to influence attitudes, which in turn shapes related practices [20, 21]. Consistent with the KAP framework, our study demonstrated that the NCDIP policy was associated with positive changes in dentists' behaviors. More than 90% of dentists reported proactively using centrally procured dental implants, actively understanding the policy, and promoting it to patients, suggesting a high level of recognition and practical acceptance of the NCDIP policy among dentists. Compared with previous findings on centralized drug procurement policies, the NCDIP policy appears to have gained broader acceptance among dental professionals [22].

Differences in knowledge level were significantly associated with variations in practice, indicating that educational interventions may represent an effective strategy for improving policy compliance and clinical implementation. Enhancing dentists' understanding of the policy may therefore facilitate better practice behaviors, thereby supporting the sustained implementation of NCDIP and broader healthcare

reform objectives [23]. In addition, dentists working in private hospitals exhibited notable behavioral changes, which aligns with our attitudinal findings and further supports the notion that cognition and attitudes play a critical role in shaping professional behavior [24].

Overall, this study provides empirical evidence on the knowledge, attitudes, and practices of dentists toward the NCDIP policy and identifies key factors influencing its implementation.

First, the high level of support and active engagement among dentists suggests that the NCDIP policy is beneficial for patients and may contribute to improving doctor–patient relationships, supporting its continued advancement. Second, our findings indicate that further efforts are needed to strengthen policy implementation among dentists in public hospitals. Finally, in the context of the continuously rising global expenditure on dental implants, the experience of China's centralized procurement policy may offer valuable insights and reference for other countries or regions seeking to control dental implant costs and improve access to oral healthcare.

Conclusions

Overall, most dentists demonstrated good knowledge, positive attitudes, and appropriate practices toward the NCDIP policy. At present, the policy has shown overall effective implementation; however, promotion and enforcement remain insufficient in public hospitals and should be further strengthened.

This study is the first to investigate dentists' knowledge, attitudes, and practices (KAP) regarding the NCDIP policy in China, providing a comprehensive reflection of its implementation and impact. These findings are of substantial significance for the optimization and refinement of future policy development.

Nevertheless, several limitations should be acknowledged. First, this study included dentists primarily from tertiary and secondary hospitals in large and medium-sized cities in central China; therefore, the findings may not be generalizable to primary hospitals or rural settings. Second, the survey focused exclusively on dentists, and patients' perceptions of the policy were not assessed, which may limit a comprehensive evaluation of policy implementation outcomes.

Abbreviations

NCDIP: National Centralized Dental Implants Procurement;

KAP: Knowledge, Attitudes, and Practices.

Declarations

Ethics approval and consent to participate

This study was conducted in accordance with the principles of the Declaration of Helsinki.

Ethical approval was granted by the Biomedical Research Ethics Committee of Hunan Normal University (Approval No.: 2025-912).

Electronic informed consent was obtained from all participants prior to enrollment. Participants were fully informed about the study objectives and were assured of their right to withdraw at any time without penalty.

Consent for publication

Not applicable.

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Availability of data and materials

The original data presented in this study are included in the article and its Supplementary Materials. Further inquiries may be directed to the corresponding author.

Competing interests

The authors declare that they have no competing interests.

Author's contributions

Conceptualization, T.X.; Methodology,T.X.;Validation, L.G., W.J., and B.F.; Data curation, L.G. and B.F.; Formal analysis, T.X. and B.F.; Investigation,Z.Y.,Y.M.and Y.H.; Resources, M.L.and B.F.; Writingoriginal draft,T.X.;Writingreview and editing, B.F.,M.L. and Z.X.; Supervision,M.L. and B.F.

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Author's information

[1]School of Stomatology, Hunan University of Chinese Medicine,Changsha, China;

[2]College of Integrated Traditional Chinese and Western Medicine, Hunan University of Chinese Medicine, Changsha, China;

[3]Changsha Stomatological Hospital,Changsha,China;

[4]Qinghai Institute of Health Science.

E-mail address: 516642538@qq.com(T.X.);1258597810@qq.com(Y.M)2316696344@qq.com(Z.Y.)1455118397@qq.com(Z.X.);362281956@qq.com(L.G.); 997180659@qq.com(Y.H.); 597395251@qq.com(W.J.); 1424449448@qq.com(B.F.);liming@hnucm.edu.cn(M.L.)

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Tables

Table1 *Basic characteristics of participants*

Variable	Number(n=1153)	Percentage(%)
Age		
20-30	654	56.72
31-55	356	30.88
>55	143	12.40
Gender		
Male	708	61.41
Female	445	38.59
Education level		
Below Bachelor	861	74.67
Bachelor	229	19.86
Master or above	63	5.46
Professional title		
Primary	375	32.52
Intermediate	472	40.94
Senior	306	26.54
Hospital Category		
Tertiary hospitals	485	42.06
Secondary hospitals	188	16.31
Primary hospitals	79	6.85
Private hospitals	401	34.78
Professional working experience (years)		
≤5	164	14.22
5–10	263	22.81
10-20	371	32.18
20-30	177	15.35
30	178	15.44
City		
Large metropolitan areas	385	33.39

Medium-size urban areas	388	33.65
Small urban areas	380	32.96

Table2. *Factors associated with knowledge level*

Factors	Knowledge		Unadjusted OR(95% CI)	*P*	Adjusted OR(95%CI)	*P*
	Poor, *N*(%)	Good, *N*(%)				
City						
Large metropolitan areas	41(10.65)	344(89.35)	Ref.		Ref.	
Medium-size urban areas	5(1.29)	383(98.71)	9.13 (3.91-26.67)	<0.001	5.40 (1.91-18.47)	0.003*
Small urban areas	3(0.79)	377(99.21)	14.98 (5.39-62.26)	<0.001	11.11 (3.48-51.30)	<0.001*
Age						
20-30	23(3.52)	631(96.48)	Ref.		Ref.	
31-55	14(3.93)	342(96.07)	0.89 (0.46-1.79)	0.737	0.18 (0.04-0.69)	0.017*
>55	12(8.39)	131(91.61)	0.40 (0.20-0.85)	0.012	0.05 (0.00-0.55)	0.028*
Gender						
Male	24(3.39)	684(96.61)	Ref.		Ref.	
Female	25(5.62)	420(94.38)	0.59 (0.33-1.05)	0.071	0.56 (0.30-1.02)	0.058
Education level						
Below Bachelor	41(4.76)	820(95.24)	Ref.		Ref.	
Bachelor	4(1.75)	225(98.25)	1.15 (0.51-2.36)	0.716	1.32 (0.56-2.89)	0.502
Master or above	4(6.35)	59(93.65)	1.98 (0.74-5.38)	0.167	2.13 (0.72-6.44)	0.17
Professional title						
Primary	23(6.13)	352(93.87)	Ref.		Ref.	
Intermediate	12(2.54)	460(97.46)	2.50 (1.25-5.27)	0.011	6.27 (1.71-26.21)	0.008*
Senior	14(4.58)	292(95.42)	1.36 (0.70-2.76)	0.374	2.82 (0.48-19.49)	0.268
Hospital Category						
Tertiary hospitals	20(4.12)	465(95.88)	Ref.		Ref.	

Secondary hospitals	14(7.45)	174(92.55)	0.53 (0.27-1.10)	0.082	0.69 (0.33-1.48)	0.337
Primary hospitals	7(8.86)	72(91.14)	0.44 (0.19-1.16)	0.074	0.89 (0.36-2.40)	0.798
Private hospitals	8(2.00)	393(98.00)	2.11 (0.95-5.15)	0.078	0.98 (0.39-2.70)	0.969
Professional working experience (years)						
≤10	16(3.75)	411(96.25)	Ref.		Ref.	
10~20	20(5.39)	351(94.61)	0.68 (0.34-1.34)	0.267	0.65 (0.26-1.79)	0.377
20	13(3.66)	342(96.34)	1.02 (0.49-2.20)	0.95	6.22 (0.83-132.85)	0.124

Table3.1 *Factors associated with attitude level(Health care reform)*

Factors	Attitude		Unadjusted OR(95% CI)	*P*	Adjusted OR(95% CI)	*P*
	Poor, *N*(%)	Good, *N*(%)				
Age						
20-30	124 (19.65)	507 (80.35)	Ref.		Ref.	
31-55	75 (21.93)	267 (78.07)	0.87 (0.63-1.21)	0.4	1.18 (0.70-2.03)	0.537
>55	104 (44.26)	131 (55.74)	0.94 (0.60-1.53)	0.802	1.65 (0.70-3.94)	0.257
Gender						
Male	173 (25.29)	511 (74.71)	Ref.		Ref.	
Female	53 (12.62)	367 (87.38)	2.34 (1.69-3.30)	<0.001	2.59 (1.82-3.72)	<0.001*
Education level						
Below Bachelor	24 (96.00)	1 (4.00)	Ref.		Ref.	
Bachelor	131 (96.32)	5 (3.68)	0.71 (0.43-1.12)	0.15	0.74 (0.44-1.21)	0.243
Master or above	71 (97.26)	2 (2.74)	0.53 (0.31-0.86)	0.013	0.44 (0.24-0.81)	0.009
Professional title						
Primary	55 (15.63)	297 (84.38)	Ref.		Ref.	
Intermediate	98 (21.30)	362 (78.70)	0.68 (0.47-0.98)	0.041	0.65 (0.41-1.02)	0.065
Senior	73 (25.00)	219 (75.00)	0.56 (0.37-0.82)	0.003	0.36 (0.18-0.70)	0.003*
Hospital Category						
Tertiary hospitals	86 (18.49)	379 (81.51)	Ref.		Ref.	
Secondary hospitals	25 (14.37)	149 (85.63)	1.35 (0.84-2.23)	0.222	1.17 (0.71-2.00)	0.54
Primary hospitals	17 (23.61)	55 (76.39)	0.73 (0.41-1.36)	0.306	0.62 (0.33-1.20)	0.14
Private hospitals	98 (24.94)	295 (75.06)	0.68 (0.49-0.95)	0.022	0.48 (0.32-0.71)	<0.001*

Professional working experience (years)						
≤10	72 (68.57)	33 (31.43)	Ref.		Ref.	
10~20	81 (23.08)	270 (76.92)	0.71 (0.50-1.01)	0.057	0.92 (0.58-1.45)	0.704
20	73 (21.35)	269 (78.65)	0.78 (0.54-1.13)	0.185	1.24 (0.60-2.59)	0.558
City						
Large metropolitan areas	69 (20.06)	275 (79.94)	Ref.		Ref.	
Medium-size urban areas	87 (22.72)	296 (77.28)	0.85 (0.60-1.22)	0.384	1.34 (0.86-2.10)	0.2
Small urban areas	70 (18.57)	307 (81.43)	1.10 (0.76-1.59)	0.612	1.55 (0.98-2.47)	0.063

Table3.2 *Factors associated with attitude level(Reduce the economic burden on patients)*

Factors	Attitude		Unadjusted OR(95% CI)	*P*	Adjusted OR(95%CI)	*P*
	Poor, *N*(%)	Good, *N*(%)				
City						
Large metropolitan areas	63 (18.31)	281 (81.69)	Ref.		Ref.	
Medium-size urban areas	33 (8.62)	350 (91.38)	2.38 (1.53-3.76)	<0.001	2.98 (1.72-5.26)	<0.001*
Small urban areas	22 (5.84)	355 (94.16)	3.62 (2.21-6.14)	<0.001	4.37 (2.41-8.19)	<0.001*
Age						
20-30	56 (8.87)	575 (91.13)	Ref.		Ref.	
31-55	43 (12.57)	299 (87.43)	0.68 (0.45-1.04)	0.07	0.39 (0.19-0.81)	0.013*
>55	112 (46.09)	131 (53.91)	0.57 (0.33-1.03)	0.051	0.53 (0.17-1.67)	0.277
Gender						
Male	85 (12.43)	599 (87.57)	Ref.		Ref.	
Female	33 (7.86)	387 (92.14)	1.66 (1.10-2.57)	0.018	1.78 (1.15-2.81)	0.011*
Education level						
Below Bachelor	14 (8.70)	147 (91.30)	Ref.		Ref.	
Bachelor	71 (10.77)	588 (89.23)	0.79 (0.42-1.40)	0.439	0.74 (0.38-1.35)	0.342
Master or above	33 (11.62)	251 (88.38)	0.72 (0.36-1.37)	0.336	0.54 (0.25-1.13)	0.109
Professional title						
Primary	41 (11.65)	311 (88.35)	Ref.		Ref.	
Intermediate	41 (8.91)	419 (91.09)	1.35 (0.85-2.13)	0.201	1.39 (0.75-2.60)	0.296
Senior	36 (12.33)	256 (87.67)	0.94 (0.58-1.52)	0.791	0.92 (0.37-2.27)	0.861

Hospital Category						
Tertiary hospitals	48 (10.32)	417 (89.68)	Ref.		Ref.	
Secondary hospitals	17 (9.77)	157 (90.23)	1.06 (0.60-1.95)	0.837	1.18 (0.65-2.23)	0.595
Primary hospitals	11 (15.28)	61 (84.72)	0.64 (0.32-1.35)	0.214	0.98 (0.47-2.15)	0.947
Private hospitals	42 (10.69)	351 (89.31)	0.96 (0.62-1.49)	0.862	0.57 (0.34-0.95)	0.032
Professional working experience (years)						
≤10	41 (9.98)	370 (90.02)	Ref.		Ref.	
10~20	38 (10.83)	313 (89.17)	0.91 (0.57-1.46)	0.701	1.29 (0.68-2.53)	0.45
20	39 (11.40)	303 (88.60)	0.86 (0.54-1.37)	0.527	2.01 (0.77-5.39)	0.16

Table3.3 *Factors associated with attitude level(Reduce doctor-patient disputes)*

Factors	Knowledge		Unadjusted OR(95% CI)	P	Adjusted OR(95%CI)	P
	Poor, *N*(%)	Good, *N*(%)				
City						
Large metropolitan areas	77 (22.38)	267 (77.62)	Ref.		Ref.	
Medium-size urban areas	144 (37.60)	239 (62.40)	0.48 (0.34-0.66)	<0.001	0.68 (0.46-1.02)	0.061
Small urban areas	125 (33.16)	252 (66.84)	0.58 (0.42-0.81)	0.001	0.76 (0.51-1.14)	0.192
Age						
20-30	188 (29.79)	443 (70.21)	Ref.		Ref.	
31-55	126 (36.84)	216 (63.16)	0.73 (0.55-0.96)	0.025	0.94 (0.59-1.49)	0.792
>55	32 (24.43)	99 (75.57)	1.31 (0.86-2.05)	0.218	1.39 (0.66-2.98)	0.39
Gender						
Male	248 (36.26)	436 (63.74)	Ref.		Ref.	
Female	98 (23.33)	322 (76.67)	1.87 (1.42-2.47)	<0.001	1.95 (1.46-2.64)	<0.001*
Education level						
Below Bachelor	42 (26.09)	119 (73.91)	Ref.		Ref.	
Bachelor	201 (30.50)	458 (69.50)	0.80 (0.54-1.18)	0.272	0.77 (0.50-1.17)	0.227
Master or above	103 (36.27)	181 (63.73)	0.62 (0.40-0.95)	0.028	0.47 (0.27-0.79)	0.005*
Professional title						
Primary	86 (24.43)	266 (75.57)	Ref.		Ref.	
Intermediate	155 (33.70)	305 (66.30)	0.64 (0.47-0.87)	0.004	0.91 (0.61-1.34)	0.623
Senior	105 (35.96)	187 (64.04)	0.58 (0.41-0.81)	0.002	0.56 (0.32-1.00)	0.05

Hospital Category						
Tertiary hospitals	132 (28.39)	333 (71.61)	Ref.		Ref.	
Secondary hospitals	37 (21.26)	137 (78.74)	1.47 (0.98-2.25)	0.07	1.30 (0.83-2.05)	0.258
Primary hospitals	18 (25.00)	54 (75.00)	1.19 (0.68-2.15)	0.551	0.84 (0.46-1.58)	0.57
Private hospitals	159 (40.46)	234 (59.54)	0.58 (0.44-0.78)	<0.001	0.50 (0.35-0.71)	<0.001*
Professional working experience (years)						
≤10	100 (24.33)	311 (75.67)	Ref.		Ref.	
10~20	138 (39.32)	213 (60.68)	0.50 (0.36-0.68)	<0.001	0.56 (0.38-0.84)	0.005*
20	108 (31.58)	234 (68.42)	0.70 (0.51-0.96)	0.027	1.00 (0.53-1.89)	0.999

Table4.1 *Factors associated with practice level(Priority should be given to using the centralized dental implants)*

Factors	Knowledge		Unadjusted OR(95% CI)	P	Adjusted OR(95% CI)	P
	Poor, *N*(%)	Good, *N*(%)				
City						
Large metropolitan areas	55 (16.0)	289 (84.0)	Ref.		Ref.	
Medium-size urban areas	43 (11.2)	340 (88.8)	1.50 (0.98-2.32)	0.062	1.72 (1.01-2.96)	0.048*
Small urban areas	32 (8.5)	345 (91.5)	2.05 (1.30-3.29)	0.002	2.41 (1.38-4.29)	0.002*
Age						
20-30	81 (12.8)	550 (87.2)	Ref.		Ref.	
31-55	36 (10.5)	306 (89.5)	1.25 (0.83-1.92)	0.291	1.10 (0.58-2.14)	0.764
>55	13 (9.9)	118 (90.1)	1.34 (0.74-2.59)	0.358	1.41 (0.45-4.51)	0.554
Gender						
Male	89 (13.0)	595 (87.0)	Ref.		Ref.	
Female	41 (9.8)	379 (90.2)	1.38 (0.94-2.06)	0.105	1.48 (0.99-2.25)	0.062
Education level						
Below Bachelor	13 (8.1)	148 (91.9)	Ref.		Ref.	
Bachelor	84 (12.8)	575 (87.3)	0.60 (0.31-1.07)	0.103	0.59 (0.30-1.09)	0.111
Master or above	33 (11.6)	251 (88.4)	0.67 (0.33-1.28)	0.24	0.56 (0.25-1.19)	0.141
Professional title						
Primary	47 (13.4)	305 (86.7)	Ref.		Ref.	
Intermediate	53 (11.5)	407 (88.5)	1.18 (0.78-1.80)	0.432	0.99 (0.57-1.70)	0.96
Senior	30 (10.3)	262 (89.7)	1.35 (0.83-2.21)	0.232	0.68 (0.29-1.58)	0.369

Hospital Category						
Tertiary hospitals	41 (8.8)	424 (91.2)	Ref.		Ref.	
Secondary hospitals	21 (12.1)	153 (87.9)	0.70 (0.41-1.25)	0.218	0.69 (0.38-1.25)	0.209
Primary hospitals	16 (22.2)	56 (77.8)	0.34 (0.18-0.66)	<0.001	0.41 (0.21-0.84)	0.012*
Private hospitals	52 (13.2)	341 (86.8)	0.63 (0.41-0.98)	0.039	0.45 (0.27-0.75)	0.002*
Professional working experience (years)						
≤10	51 (12.4)	360 (87.6)	Ref.		Ref.	
10~20	49 (14.0)	302 (86.0)	0.87 (0.57-1.33)	0.527	0.95 (0.56-1.65)	0.862
20	30 (8.8)	312 (91.2)	1.47 (0.92-2.39)	0.11	1.65 (0.66-4.21)	0.287

Table4.2 *Factors associated with practice level(Proactively understand the policy)*

Factors	Knowledge		Unadjusted OR(95% CI)	P	Adjusted OR(95% CI)	P
	Poor, *N*(%)	Good, *N*(%)				
City						
Large metropolitan areas	68 (15.6)	276 (84.4)	Ref.		Ref.	
Medium-size urban areas	15 (3.9)	368 (96.1)	2.73 (1.70-4.48)	<0.001	3.12 (1.72-5.78)	<0.001*
Small urban areas	18 (4.8)	359 (95.2)	3.70 (2.21-6.42)	<0.001	4.72 (2.54-9.13)	<0.001*
Age						
20-30	60 (9.5)	571 (90.5)	Ref.		Ref.	
31-55	25 (7.3)	317 (92.7)	1.18 (0.74-1.91)	0.493	1.30 (0.62-2.81)	0.5
>55	16 (12.2)	115 (87.8)	0.66 (0.38-1.19)	0.148	1.41 (0.41-4.87)	0.585
Gender						
Male	69 (10.1)	615 (89.9)	Ref.		Ref.	
Female	32 (7.6)	388 (92.4)	2.01 (1.28-3.24)	0.003	2.08 (1.31-3.42)	0.003*
Education level						
Below Bachelor	18 (11.2)	143 (88.8)	Ref.		Ref.	
Bachelor	59 (9.0)	600 (91.0)	1.34 (0.77-2.26)	0.282	1.42 (0.79-2.49)	0.23
Master or above	24 (8.5)	260 (91.5)	1.61 (0.85-3.03)	0.141	1.53 (0.73-3.21)	0.263
Professional title						
Primary	48 (13.6)	304 (86.4)	Ref.		Ref.	
Intermediate	31 (6.7)	429 (93.3)	1.70 (1.06-2.74)	0.029	1.20 (0.62-2.29)	0.586
Senior	22 (7.5)	270 (92.5)	1.18 (0.72-1.96)	0.507	0.71 (0.27-1.85)	0.478

Hospital Category						
Tertiary hospitals	39 (8.4)	426 (91.6)	Ref.		Ref.	
Secondary hospitals	18 (10.3)	156 (89.7)	0.77 (0.44-1.39)	0.369	0.88 (0.48-1.64)	0.673
Primary hospitals	19 (26.4)	53 (73.6)	0.52 (0.26-1.12)	0.076	0.86 (0.42-1.91)	0.704
Private hospitals	25 (6.4)	368 (93.6)	0.93 (0.58-1.50)	0.774	0.64 (0.36-1.12)	0.12
Professional working experience (years)						
≤10	41 (10.0)	370 (90.0)	Ref.		Ref.	
10~20	34 (9.7)	317 (90.3)	0.84 (0.52-1.36)	0.475	0.73 (0.39-1.35)	0.306
20	26 (7.6)	316 (92.4)	0.96 (0.58-1.58)	0.867	0.98 (0.35-2.79)	0.968

Table4.3 *Factors associated with practice level(Proactively promote policies)*

Factors	Knowledge		Unadjusted OR(95% CI)	P	Adjusted OR(95% CI)	*P*
	Poor, *N*(%)	Good, *N*(%)				
City						
Large metropolitan areas	59(17.15)	285(82.85)	Ref.		Ref.	
Medium-size urban areas	27(7.05)	356(92.95)	6.04 (3.48-11.19)	<0.001	5.01 (2.60-10.16)	<0.001*
Small urban areas	20(5.31)	357(94.69)	4.91 (2.92-8.69)	<0.001	4.20 (2.25-8.19)	<0.001*
Age						
20-30	60(9.51)	571(90.49)	Ref.		Ref.	
31-55	28(8.19)	314(91.81)	1.33 (0.83-2.20)	0.247	0.90 (0.40-2.05)	0.804
>55	18(13.74)	113(86.26)	0.76 (0.43-1.40)	0.348	0.74 (0.19-2.87)	0.661
Gender						
Male	80(11.70)	604(88.30)	Ref.		Ref.	
Female	26(6.19)	394(93.81)	1.36 (0.89-2.13)	0.168	1.48 (0.94-2.39)	0.1
Education level						
Below Bachelor	20(12.42)	141(87.58)	Ref.		Ref.	
Bachelor	63(9.56)	596(90.44)	1.28 (0.71-2.20)	0.386	1.29 (0.69-2.33)	0.404
Master or above	23(8.10)	261(91.90)	1.36 (0.71-2.59)	0.345	1.10 (0.52-2.34)	0.798
Professional title						
Primary	42(11.93)	310(88.07)	Ref.		Ref.	
Intermediate	34(7.39)	426(92.61)	2.19 (1.37-3.54)	0.001	1.59 (0.80-3.15)	0.184
Senior	30(10.27)	262(89.73)	1.94 (1.15-3.35)	0.015	1.65 (0.57-4.93)	0.363
Hospital Category						
Tertiary hospitals	40(8.60)	425(91.40)	Ref.		Ref.	

Secondary hospitals	19(10.92)	155(89.08)	0.79 (0.45-1.46)	0.44	1.00 (0.55-1.89)	0.997
Primary hospitals	11(15.28)	61(84.72)	0.26 (0.14-0.48)	<0.001	0.47 (0.25-0.92)	0.024
Private hospitals	36(9.16)	357(90.84)	1.35 (0.81-2.29)	0.262	0.86 (0.47-1.60)	0.638
Professional working experience (years)						
≤10	37(9.00)	374(91.00)	Ref.		Ref.	
10~20	37(10.54)	314(89.46)	1.03 (0.64-1.68)	0.894	0.87 (0.46-1.66)	0.659
⩾20	32(9.36)	310(90.64)	1.35 (0.81-2.28)	0.256	1.17 (0.39-3.60)	0.784