

Dentists' knowledge, attitude and practice towards National Centralized dental implants Procurement policy in China: A cross-sectional study

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Abstract

Background

National centralized dental implants procurement (NCDIP) was a policy implemented by the Chinese government starting from September 2022, aimed at ensuring that the people receive high-quality, efficient, and affordable dental restoration services, and promoting the healthy and orderly development of the dental implant industry. The policy has been implemented for some time now, and a comprehensive investigation is needed to explore its specific effects. Our study aimed to comprehensively understand the knowledge, attitude, behavior(KAP) of dentists towards this policy, evaluate the implementation of the policy, explore the factors that affect KAP, and provide assistance for the improvement and implementation of future policies

Methods

We conducted a cross-sectional study from May to June in 2023 in China. Online questionnaire was to investigate the KAP of dentists towards NCDIP policy. Logistic regression analysis was used to identify factors that influence KAP.

Results

A total of 1049 dentists completed the questionnaires. 98.66% of dentists knew the policy of NCDIP, and 72.45% of them agreed that they were familiar with this policy. Female dentists had better knowledge towards this policy. At attitudes level, 74.17% dentists believed that the centralized procurement policy could have a significant impact on healthcare reform, 75.04% of dentists agreed that it is reasonable to implement this policy for dental implants to reduce the medical costs of dental implants,93.94% of dentists believing that the policy has reduced the economic burden of dental implants for patients with missing teeth. Dentists working in private hospital were more convinced of the impact of this policy. At the practice level, 63.63% of dentists will prioritize selecting centrally purchased implants for treatment, 90.93% of dentists will actively promote the national centralized procurement policy for dental implants to patients.96.96% of dentists will proactively understand the national centralized procurement policy for dental implants.83.55% of dentists and their families also will choose implants that are centrally procured by the country. Dentists with higher education levels have a higher willingness to choose centralized seed collection and dental implantation. Dentists working in private hospital More willing to proactively understand policies and promote them.

Conclusions

Overall, most dentists have a good knowledge, attitudes, and practices towards the NCDIP policy. At present, the implementation effect of the policy is good, but in public hospitals, the promotion and implementation of the policy still need to be strengthened

Background

Oral disease has been a major global health burden and also one of the most common public health problems worldwide[1]. The latest Fourth National Oral Health Survey showed that the oral hygiene situation in China was not ideal and urgently needed improvement[2]. Dental implants were considered as one of the most important innovations in contemporary dentistry[3]. Nowadays, oral rehabilitation is increasingly achieved through the insertion of dental implants[4]. This takes into account the patient's and practitioner's growing desire for aesthetically and chewing-functionally demanding as well as minimally invasive solutions with a high durability. However, the prohibitive cost of dental implants had become a major factor hindering patients from receiving further treatment[5; 6]. The problem of non-standard fees and heavy cost burden in the field of dental implantation has long existed. With the improvement of living standards and the deepening of population aging, it had become a pain point that troubles the people's livelihood. Therefore, lower dental implant treatment costs and reasonable implant prices play an important role in better serving the general public and ensuring their oral health. Suppressing the price of such high-value medical consumables has become an important part of deepening the reform of the medical and health system. In January 2022, the Executive Meeting of the State Council in China decided to gradually expand the coverage of high-value medical consumables for centralized procurement, and explicitly requested that dental implants of public concern be included in the scope of centralized procurement. In September, the National Medical Insurance Bureau in China issued a notice on the special management of dental implant medical service fees and consumables prices, further standardizing the charging methods for dental implant medical services and consumables, and strengthening the price control of dental implant and other medical services. Carefully organize and carry out centralized procurement of dental implant consumables, as well as implement comprehensive management of dental implant fees, to comprehensively cover the special management of dental implant prices in public and private medical institutions.

Previously, China had adopted a centralized procurement model for some drugs, resulting in a significant decrease in drug prices[7]. At the same time, the prices of unselected drugs were also linked, further promoting the price reduction effect and effectively reducing the medical burden on patients, especially those with chronic diseases and severe illnesses[8]. Meanwhile, medical devices technology is among the important technologies in the countries, and public procurement is an effective policy on this technology. Throughout history, European countries had adopted different methods to achieve low prices for medical devices, such as reference pricing, price discounts, price reductions, and centralized procurement[9]. Procurement in the health care sector is being increasingly accumulated [10] and expanded, thereby a number of governments have achieved significant price reductions. At present, National Centralized dental implants Procurement(NCDIP) policy has been implemented in some regions of China for a period of time, and the prices of dental implants have significantly decreased. However,

whether the NCDIP used in medical services can achieve the desired therapeutic effect and how dentists evaluate it all required us to conduct a comprehensive survey to understand the current status of policy implementation.

The model of knowledge, attitude, and practice (KAP) hold that knowledge and information are the basis for establishing positive and correct beliefs and attitudes, thus promoting health-related behaviors, while beliefs and attitudes are the driving forces for behavior change[11]. Currently, there was little study about KAP regarding NCDIP policy among dentists. Our study aimed to investigate how dentists in China understand and execute this policy in order to provide suggestions and support for the improvement of this policy.

Methods and materials

Study Design

This was a cross-sectional study based on questionnaire survey which focused on dentists from various regions across China. The survey was conducted from May to June 2023.

Simple Size

We used PASS 11.0 to calculate the sample size. There has been no previous research investigating the awareness rate of dentists regarding the policy of centralized dental implant procurement, so we referred to previous study reported that knowledge rate of doctors about drug centralized procurement policy which was 62.5%[12]. And we set $\alpha = 0.05$, $\beta = 0.1$. According to the calculation, the required sample size for this survey was at least 603.

Questionnaire design

This study referred to the relevant literature of the national drug centralized procurement questionnaire survey. Based on extensive literature review and discussion by three clinical dentists, and combined with the actual situation of the domestic implant industry, the design was completed after repeated modifications and improvements. The questionnaire aimed to be concise and clear, with standardized wording, and easy to fill out. The effectiveness of the questionnaire content was evaluated by three experts in the oral field. Prior to the formal survey, a pilot questionnaire survey was conducted and reliability and effectiveness analysis were conducted. The questionnaire including KAP which was composed of 22 mandatory single-choice items and two multiple-choice item, and it consisted of five sections: 1) dentists' characteristics: profession, education, working experience, etc.; 2) Knowledge part: familiarity with NCDIP policy, this part was provided on a 5-level Likert scale (1 = "very unfamiliar", 2 = "less familiar", 3 = "general", 4 = "more familiar", 5 = "very familiar") and the ways to know this policy; 3) Attitude part: concerning about the policy impact, this part was provided on a 5-level Likert scale (1 = "strongly disagree", 2 = "disagree", 3 = "uncertain", 4 = "agree", 5 = "strongly agree"); 4) Practice part: interpretation, guidance for patients, and dental implant choice, this part was provided on a 5-level Likert

scale, the options were assigned in order of 5 to 1 point according to the degree[13]; Detailed information related to KAP towards NCDIP policy were presented in Supplementary Material.

Data collection

We used the snowball sampling method for investigation. We distributed the questionnaire to the Questionnaire Star platform, and the survey subjects completed the questionnaire by scanning WeChat to clarify the research purpose and filling out precautions, ensuring the quality of the questionnaire. All data from the survey questionnaire will be automatically saved to the Questionnaire Star network platform. Multiple choices, omissions, and filling in time less than 1 minute will be considered invalid questionnaires and excluded.

Statistical analysis

IBM SPSS Statistics 22.0 was used to performed data statistics. Percentages were used to describe categorical variables. The influence factors that associated with KAP levels were evaluated through univariate logistic regression. The demographic factors with $P < 0.05$ in the univariate logistic regression analysis were taken as covariates in the multivariate logistic regression. The multivariate logistic regression method was conducted to identify the associated factors of KAP levels. The statistical significance level was set at $P < 0.05$.

Results

Characteristics of participants

The characteristics of the study population were presented in Table 1. A total of 1052 dentists participated in this questionnaire survey. Three of them did not complete the questionnaire, in the end, 1049 dentists were included in statistical analysis. The efficiency of a questionnaire survey was 99.71%. Most of them were 20-30 years old (64.73%), 68 (6.48%) dentists came from large metropolitan areas, 601 (57.29%) dentists came from medium-size urban areas and 380 (36.22%) dentists came from small urban areas.

Table 1
Basic characteristics of participants

Variable	Number(n = 1049)	Percentage(%)
Age		
20–30	679	64.73
31–55	317	30.22
> 55	53	5.15
Gender		
Male	630	60.05
Female	419	39.94
Education level		
Below Bachelor	138	13.16
Bachelor	542	51.67
Master or above	369	35.18
Professional title		
Primary	277	26.41
Intermediate	506	48.24
Senior	266	25.36
Hospital Category		
Tertiary hospitals	468	44.61
Secondary hospitals	100	9.53
Primary hospitals	19	1.81
Private hospitals	462	44.04
Professional working experience (years)		
≤ 5	190	18.11
5–10	254	24.21
10–20	329	31.36
20–30	187	17.83
>30	89	8.48
City		

Variable	Number(n = 1049)	Percentage(%)
Large metropolitan areas	68	6.48
Medium-size urban areas	601	57.29
Small urban areas	380	36.22

Table 2
Factors associated with knowledge level

Factors	Knowledge		Unadjusted OR(95% CI)	P	Adjusted OR (95% CI)	P
	Poor, N(%)	Good, N(%)				
Age						
20–30	9(1.32)	670(98.67)				
31–55	4(1.26)	313(98.74)	0.951(0.291 ~ 3.113)	0.934	4.030(0.814 ~ 19.946)	0.088
> 55	1(1.89)	52(98.11)	1.432(0.178 ~ 11.519)	0.736	9589477	0.994
Gender						
Male	4(0.63)	626(99.37)				
Female	10(2.39)	409(97.61)	3.826(1.192 ~ 12.282)	0.024	4.927(1.295 ~ 18.750)	0.019
Education level						
Below Bachelor	4(2.90)	134(97.10)				
Bachelor	6(1.11)	536(98.89)	0.375(0.104 ~ 1.348)	0.133	0.577(0.136 ~ 2.457)	0.457
Master or above	4(1.08)	365(98.92)	0.367(0.091 ~ 1.489)	0.161	0.274(0.035 ~ 2.171)	0.220
Professional title						
Primary	9(3.25)	268(96.75)				
Intermediate	3(0.59)	503(99.41)	0.178(0.048 ~ 0.662)	0.010	0.128(0.027 ~ 0.615)	0.010
Senior	2(0.75)	264(99.25)	0.226(0.048 ~ 1.504)	0.058	0.122(0.014 ~ 1.058)	0.056
Hospital Category						
Tertiary hospitals	7(1.50)	461(98.50)				
Secondary hospitals	0(0.00)	100(100.00)	<0.001	0.997	<0.001	0.996
Primary hospitals	0(0.00)	19(100.00)	<0.001	0.999	<0.001	0.998
Private hospitals	7(1.51)	455(98.49)	1.013(0.353 ~ 2.912)	0.981	0.557(0.132 ~ 2.357)	0.427

Factors	Knowledge		Unadjusted OR(95% CI)	P	Adjusted OR (95% CI)	P
Professional working experience (years)						
≤ 10	6(1.35)	438(98.65)				
10 ~ 20	7(2.13)	322(97.87)	1.587(0.528 ~ 4.767)	0.411	3.633(0.742 ~ 18.041)	0.115
20 ~ 30	0(0.00)	187(100.00)	<0.001	0.995	<0.001	0.994
>30	1(1.12)	88(98.88)	0.830(0.099 ~ 6.976)	0.863	<0.001	0.995
City						
Large metropolitan areas	1(1.47)	67(98.53)				
Medium-size urban areas	10(1.67)	591(98.33)	1.134(0.143 ~ 8.994)	0.905	0.651(0.070 ~ 6.016)	0.705
Small urban areas	3(0.79)	377(99.21)	0.533(0.055 ~ 5.202)	0.588	0.306(0.024 ~ 3.881)	0.361

Dentists' knowledges about the NCDIP policy

98.66% of dentists knew the policy of NCDIP, and 72.45% of them agreed that they were familiar with this policy. Most dentists knew this policy through hospital disclosure information (Supplementary Table 1).

Dentists' attitudes about the NCDIP policy

78.64% of dentists agreed that this policy plays a significant role in national healthcare reform. 75.04% of dentists agreed that it is reasonable to implement this policy for dental implants to reduce the medical costs of dental implants, 93.94% of dentists believed that the policy could reduced the economic burden of dental implants for patients, 65.51% of dentists agreed that this policy could effectively reduce doctor-patient disputes (Supplementary Figure S2).

Dentists' practice about the NCDIP policy

63.63% of dentists will prioritize selecting centrally purchased implants for treatment, 26.26% of dentists sometimes will prioritize selecting centrally purchased implants for treatment. 90.93% of dentists will actively promote the NCDIP policy to patients. 96.96% of dentists will proactively understand the new NCDIP policy. 83.55% of dentists and their families also would choose implants that are centrally procured by the country. However, as this policy has just been implemented, medical staffs had some doubts about it. 68.54% of dentists were concerned that the limitations of brand selection for centralized dental implantation may affect clinical diagnosis and treatment. And 59.39% of dentists were concerned

that the clinical use time of centralized implantation is not long, and the long-term efficacy was uncertain(Supplementary Figure S3).

Factors associated with attitude level

This questionnaire survey divided research on attitudes into Health care reform, Reduce the economic burden on patients and Reduce doctor-patient disputes three parts, 778(74.17%) dentists believed that the policy could have a significant impact on healthcare reform, while 257(24.50%) dentists did not believe that. The multivariate logistic analysis showed that gender, education level, professional title and hospital category were associated with this attitude level. Dentists with higher education level(OR = 1.982 95%CI:1.146 ~ 3.428; OR = 3.748 95%CI:1.904 ~ 7.376), senior professional title (OR = 1.978 95%CI:1.062 ~ 3.682) and working in primary(OR = 2.976 95%CI:1.015 ~ 8.722) and private hospitals(OR = 2.683 95%CI:1.792 ~ 4.016) more believed that this policy could have a significant impact on healthcare reform(Table 3.1).

Table 3.1
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	163(63.42)	507(65.17)				
31–55	83(32.30)	230(29.56)	1.122(0.826 ~ 1.526)	0.461	0.678(0.385 ~ 1.193)	0.178
> 55	11(4.28)	41(5.27)	0.835(0.419 ~ 1.661)	0.607	0.362(0.115 ~ 1.142)	0.083
Gender						
Male	190(73.93)	436(56.04)				
Female	67(26.07)	342(43.96)	0.450(0.329 ~ 0.614)	<0.001	0.435(0.309 ~ 0.611)	<0.001
Education level						
Below Bachelor	21(8.17)	113(14.52)				
Bachelor	136(52.92)	400(51.41)	1.830(1.104 ~ 3.031)	0.019	1.982(1.146 ~ 3.428)	0.014
Master or above	100(38.91)	265(34.06)	2.031(1.208 ~ 3.414)	0.008	3.748(1.904 ~ 7.376)	<0.001
Professional title						
Primary	49(19.06)	219(28.15)				
Intermediate	130(50.58)	373(47.94)	1.558(1.078 ~ 2.525)	0.018	1.258(0.817 ~ 1.935)	0.297
Senior	78(30.35)	186(23.91)	1.874(1.247 ~ 2.816)	0.002	1.978(1.062 ~ 3.682)	0.032
Hospital Category						
Tertiary hospitals	97(37.74)	364(46.79)				
Secondary hospitals	14(5.44)	86(10.54)	0.611(0.333 ~ 1.122)	0.112	0.851(0.439 ~ 1.653)	0.634
Primary hospitals	6(2.33)	13(1.67)	1.732(0.642 ~ 4.675)	0.078	2.976(1.015 ~ 8.722)	0.047

Factors	Attitude		Unadjusted OR(95% CI)	P	Adjusted OR (95% CI)	P
Private hospitals	140(54.47)	315(40.49)	1.688(1.236 ~ 2.251)	0.001	2.683(1.792 ~ 4.016)	<0.001
Professional working experience (years)						
≤ 10	94(36.58)	344(44.22)				
10–20	89(34.63)	233(29.95)	1.398(1.001 ~ 1.953)	0.049	1.143(0.743 ~ 1.759)	0.544
20–30	52(20.23)	145(18.64)	1.410(0.952 ~ 2.088)	0.087	1.250(0.599 ~ 2.612)	0.552
>30	22(8.56)	66(8.48)	1.220(0.715 ~ 2.080)	0.466	1.696(0.616 ~ 4.699)	0.307
City						
Large metropolitan areas	21(8.17)	46(5.91)				
Medium-size urban areas	153(59.53)	438(56.30)	0.765(0.442 ~ 0.324)	0.338	0.903(0.499 ~ 1.636)	0.737
Small urban areas	83(32.30)	294(37.79)	0.618(0.349 ~ 1.094)	0.099	0.825(0.429 ~ 1.584)	0.562

As for Reduce the economic burden on patients, 880(83.89%) dentists believed that the NCDIP policy could reduce the economic burden on patients. In the multivariate logistic analysis, dentists aged 31–55(OR = 2.098 95%CI:1.139 ~ 3.866) and working in private hospitals(OR = 3.408 95%CI:2.066 ~ 5.624)more agreed that this policy can reduce the economic burden on patients(Table 3.2).

Table 3.2
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(%)				
Age						
20–30	89(57.42)	581(66.02)				
31–55	59(38.06)	254(28.86)	1.516(1.057 ~ 2.175)	0.024	2.098(1.139 ~ 3.866)	0.017
> 55	7(4.52)	45(5.11)	1.015(0.444 ~ 2.322)	0.971	2.978(0.682 ~ 13.007)	0.147
Gender						
Male	110(70.97)	516(58.64)				
Female	45(29.03)	364(41.36)	0.580(0.400 ~ 0.841)	0.004	0.708(0.473 ~ 1.060)	0.093
Education level						
Below Bachelor	27(17.42)	107(12.16)				
Bachelor	85(54.84)	451(51.25)	0.747(0.461 ~ 1.209)	0.235	1.030(0.603 ~ 1.760)	0.914
Master or above	43(27.74)	322(36.59)	0.529(0.312 ~ 0.898)	0.018	1.257(0.609 ~ 2.595)	0.536
Professional title						
Primary	42(27.10)	226(25.68)				
Intermediate	80(51.61)	423(48.07)	1.018(0.677 ~ 1.529)	0.933	0.935(0.572 ~ 1.528)	0.789
Senior	33(21.29)	231(26.25)	0.769(0.470 ~ 1.257)	0.294	0.873(0.415 ~ 1.835)	0.720
Hospital Category						
Tertiary hospitals	40(25.81)	421(47.84)				
Secondary hospitals	5(3.23)	95(10.80)	0.554(0.213 ~ 1.441)	0.226	0.610(0.223 ~ 1.669)	0.336
Primary	3(1.94)	16(1.82)	1.973(0.551 ~ 7.081)	0.296	2.247(0.595 ~ 8.601)	0.232

Factors	Attitude		Unadjusted OR(95% CI)	P	Adjusted OR (95% CI)	P
hospitals			~ 7.063)		~ 8.489)	
Private hospitals	107(69.03)	348(39.55)	3.236(2.191 ~ 4.780)	<0.001	3.408(2.066 ~ 5.624)	<0.001
Professional working experience (years)						
≤ 10	57(36.77)	381(43.30)				
10–20	53(35.19)	269(30.57)	1.317(0.878 ~ 1.975)	0.183	0.994(0.590 ~ 1.672)	0.980
20–30	35(22.58)	158(17.95)	1.539(0.971 ~ 2.440)	0.067	0.683(0.302 ~ 1.546)	0.361
>30	10(6.45)	72(8.18)	0.857(0.149 ~ 1.751)	0.672	0.359(0.093 ~ 1.381)	0.136
City						
Large metropolitan areas	11(7.10)	56(6.36)				
Medium-size urban areas	93(60.00)	498(56.59)	0.951(0.480 ~ 1.883)	0.885	0.789(0.377 ~ 1.650)	0.529
Small urban areas	51(32.90)	326(37.05)	0.796(0.391 ~ 1.621)	0.530	0.633(0.283 ~ 1.412)	0.264

As for Reduce doctor-patient disputes, 622(59.29%) dentists believed that the centralized procurement policy can reduce doctor-patient disputes, 413(39.37%) did not believe this. Multivariate logistic analysis showed that dentists with master or above education level(OR = 12.576 95%CI:1.462 ~ 4.541), senior professional title(OR = 2.073 95%CI:1.195 ~ 3.595) and working in private hospital(OR = 13.163 95%CI:2.188 ~ 4.572) more agreed that this policy can reduce doctor-patient disputes(Table 3.3).

Table 3.3
Factors associated with attitude level(Reduce doctor-patient disputes)

Factors	Attitude		Unadjusted OR(95% CI)	P	Adjusted OR (95% CI)	P
	Poor, N(%)	Good, N(%)				
Age						
20–30	252(61.02)	418(67.20)				
31–55	141(34.14)	172(27.65)	1.360(1.036 ~ 1.785)	0.027	1.010(0.021 ~ 1.644)	0.967
> 55	20(4.84)	32(5.14)	1.037(0.580 ~ 1.852)	0.903	0.750(0.273 ~ 2.059)	0.577
Gender						
Male	291(70.46)	344(55.35)				
Female	121(29.54)	288(46.30)	0.481(0.369 ~ 0.626)	<0.001	0.492(0.368 ~ 0.660)	<0.001
Education level						
Below Bachelor	48(11.62)	86(13.83)				
Bachelor	211(51.09)	325(52.25)	1.163(0.755 ~ 1.724)	0.451	1.281(0.825 ~ 1.988)	0.270
Master or above	154(37.29)	211(33.92)	1.308(0.868 ~ 1.970)	0.199	2.576(1.462 ~ 4.541)	0.001
Professional title						
Primary	88(21.31)	180(28.94)				
Intermediate	199(48.18)	304(48.87)	1.339(0.981 ~ 1.828)	0.066	1.111(0.764 ~ 1.014)	0.581
Senior	126(30.51)	138(22.19)	1.868(1.315 ~ 2.653)	<0.001	2.073(1.195 ~ 3.595)	0.010
Hospital Category						
Tertiary hospitals	154(37.29)	307(49.36)				
Secondary hospitals	28(6.78)	72(11.58)	0.775(0.481 ~ 1.250)	0.296	1.053(0.615 ~ 1.802)	0.852
Primary hospitals	7(1.69)	12(1.93)	1.163(0.449 ~ 3.013)	0.756	1.855(0.666 ~ 5.167)	0.237

Factors	Attitude		Unadjusted OR(95% CI)	P	Adjusted OR (95% CI)	P
Private hospitals	224(54.24)	231(37.14)	1.933(1.480 ~ 2.524)	<0.001	3.163(2.188 ~ 4.572)	<0.001
Professional working experience (years)						
≤ 10	145(35.11)	293(47.11)				
10–20	151(36.56)	171(27.49)	1.784(1.327 ~ 2.399)	<0.001	1.358(0.923 ~ 1.998)	0.120
20–30	82(19.85)	105(16.88)	1.578(1.111 ~ 2.241)	0.011	0.927(0.487 ~ 1.767)	0.818
>30	35(8.47)	53(8.52)	1.334(0.833 ~ 2.137)	0.230	0.999(0.402 ~ 2.485)	0.998
City						
Large metropolitan areas	32(7.75)	35(5.63)				
Medium-size urban areas	242(58.60)	349(56.11)	0.758(0.457 ~ 1.259)	0.285	0.857(0.494 ~ 1.488)	0.584
Small urban areas	139(33.66)	238(38.26)	0.639(0.379 ~ 1.078)	0.093	0.781(0.428 ~ 1.423)	0.419

Factors associated with practice level

This questionnaire survey will divide research on practices into priority should be given to using the centralized dental implants, proactively understand the policy and proactively promote policies three parts, 921(87.80%) dentists would actively choose centralized implants during treatment. Multivariate logistic analysis showed that dentists with higher education level(OR = 3.241 95%CI:1.391 ~ 7.553; OR = 2.742 95%CI:1.011 ~ 7.439) and working in private hospital(OR = 2.252 95%CI:1.317 ~ 3.851) were more willing to proactively using centralized dental implants(Table 4.1).

Table 4.1

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

Factors	Practice		Unadjusted OR(95% CI)	P	Adjusted OR (95% CI)	P
	Poor, N(%)	Good, N(%)				
Age						
20–30	84(73.68)	586(63.63)				
31–55	28(24.56)	285(30.94)	0.685(0.437 ~ 1.075)	0.100	1.048(0.508 ~ 2.163)	0.899
> 55	2(1.75)	50(5.43)	0.279(0.067 ~ 1.168)	0.081	0.648(0.077 ~ 5.478)	0.691
Gender						
Male	74(64.91)	552(59.93)				
Female	40(35.09)	369(40.07)	0.089(0.538 ~ 1.214)	0.306	0.758(0.490 ~ 1.173)	0.214
Education level						
Below Bachelor	7(6.14)	127(13.79)				
Bachelor	70(61.40)	466(50.60)	2.725(1.223 ~ 6.073)	0.014	3.241(1.391 ~ 7.553)	0.006
Master or above	37(32.46)	328(35.61)	2.047(0.889 ~ 4.710)	0.092	2.742(1.011 ~ 7.439)	0.048
Professional title						
Primary	34(29.82)	234(25.41)				
Intermediate	54(47.37)	449(48.75)	0.828(0.524 ~ 1.308)	0.418	0.794(0.466 ~ 1.351)	0.395
Senior	26(22.81)	238(25.84)	0.752(0.437 ~ 1.292)	0.302	1.402(0.623 ~ 3.157)	0.415
Hospital Category						
Tertiary hospitals	39(34.21)	422(45.82)				
Secondary hospitals	9(7.89)	91(9.88)	1.070(0.501 ~ 2.287)	0.861	1.351(0.585 ~ 3.118)	0.481
Primary hospitals	3(2.63)	16(1.73)	2.029(0.566 ~ 7.268)	0.277	2.579(0.662 ~ 10.047)	0.172
Private hospitals	63(55.26)	392(42.56)	1.739(1.140 ~ 2.648)	0.010	2.252(1.317 ~ 3.841)	0.003

Factors	Practice		Unadjusted OR(95% CI)	<i>P</i>	Adjusted OR (95% CI)	<i>P</i>
			2.653)		3.851)	
Professional working experience (years)						
≤ 10	55(48.25)	383(41.59)				
10–20	41(35.96)	281(30.51)	1.016(0.659 ~ 1.566)	0.943	0.798(0.455 ~ 1.400)	0.431
20–30	14(12.28)	173(18.78)	0.564(0.305 ~ 1.041)	0.067	0.375(0.136 ~ 1.036)	0.059
>30	4(3.51)	84(9.12)	0.332(0.117 ~ 0.940)	0.038	0.299(0.055 ~ 1.643)	0.165
City						
Large metropolitan areas	8(7.02)	127(13.79)				
Medium-size urban areas	74(64.91)	466(50.60)	1.056(0.485 ~ 2.297)	0.891	0.939(0.412 ~ 2.139)	0.882
Small urban areas	32(28.07)	328(35.61)	0.684(0.301 ~ 1.557)	0.366	0.626(0.251 ~ 1.560)	0.314

As for proactively understand the policy, 984(93.80%) dentists will proactively understand the national centralized procurement policy for dental implants. In the multivariate logistic analysis dentists who working 20–30 years(OR = 0.208 95%CI:0.048 ~ 0.905) and working in private hospital(OR = 3.163 95%CI:2.188 ~ 4.572)were more willing to proactively understand the NCDIP policy(Table 4.2).

Table 4.2
Factors associated with practice level(Proactively understand the policy)

Factors	Practice		Unadjusted OR (95% CI)	P	Adjusted OR (95% CI)	P
	Poor,N(%)	Good,N(%)				
Age						
20–30	37(72.55)	633(86.24)				
31–55	13(25.49)	30(4.09)	0.741(0.388 ~ 1.415)	0.364	1.544(0.627 ~ 3.820)	0.345
> 55	1(1.96)	51(6.95)	0.335(0.045 ~ 2.495)	0.286	2.978(0.682 ~ 13.007)	0.973
Gender						
Male	33(64.71)	593(80.79)				
Female	18(35.29)	391(53.27)	0.827(0.459 ~ 1.490)	0.528	0.865(0.460 ~ 1.624)	0.651
Education level						
Below Bachelor	8(15.69)	126(17.17)				
Bachelor	29(56.86)	507(69.07)	0.901(0.402 ~ 2.108)	0.800	1.057(0.434 ~ 2.573)	0.903
Master or above	14(27.45)	351(47.82)	0.628(0.257 ~ 1.533)	0.307	0.996(0.298 ~ 3.330)	0.994
Professional title						
Primary	16(31.37)	252(34.33)				
Intermediate	27(52.94)	476(64.85)	0.893(0.473 ~ 1.689)	0.729	0.951(0.441 ~ 2.053)	0.898
Senior	8(15.69)	256(34.88)	0.492(0.207 ~ 1.171)	0.109	1.047(0.304 ~ 3.605)	0.942
Hospital Category						
Tertiary hospitals	12(23.53)	449(61.17)				
Secondary hospitals	4(7.84)	96(13.08)	1.559(0.492 ~ 4.938)	0.450	1.689(0.476 ~ 5.988)	0.417
Primary hospitals	2(3.92)	17(2.32)	4.402(0.913 ~ 21.229)	0.065	4.040(0.764 ~ 21.377)	0.100
Private hospitals	33(64.71)	422(57.49)	2.926(1.491 ~ 5.721)	0.002	3.267(1.409 ~ 7.531)	0.006

Factors	Practice		Unadjusted OR (95% CI)	<i>P</i>	Adjusted OR (95% CI)	<i>P</i>
			5.741)		7.575)	
Professional working experience (years)						
≤ 10	23(45.10)	415(56.54)				
10–20	22(43.14)	300(40.87)	1.323(0.724 ~ 2.418)	0.363	0.959(0.445 ~ 2.067)	0.914
20–30	4(7.84)	183(24.93)	0.394(0.134 ~ 1.157)	0.090	0.208(0.048 ~ 0.905)	0.036
>30	2(3.02)	86(11.72)	0.420(0.097 ~ 1.813)	0.245	0.307(0.031 ~ 3.035)	0.312
City						
Large metropolitan areas	6(11.76)	61(8.31)				
Medium-size urban areas	27(52.94)	564(76.84)	0.487(0.193 ~ 1.225)	0.126	0.383(0.138 ~ 1.060)	0.065
Small urban areas	18(35.29)	359(48.91)	0.510(0.195 ~ 1.335)	0.170	0.392(0.127 ~ 1.215)	0.105

As for proactively promote policies, 933(88.94%) dentists would proactively promote theNCDIP policy to patients. The main factors that affect this behavior were gender and hospital category. Dentists in private hospital(OR = 3.257 95%CI:1.808 ~ 5.866)were more willing to promote this policy while female dentists(OR = 0.389 95%CI:0.233 ~ 0.651) were not very willing to promote this policy(Table 4.3).

Table 4.3
Factors associated with practice level(*Proactively promote policies*)

Factors	Practice		Unadjusted OR(95% CI)	P	Adjusted OR (95% CI)	P
	Poor, N(%)	Good, N(%)				
Age						
20–30	76(57.58)	594(63.67)				
31–55	24(18.18)	289(30.98)	0.649(0.402 ~ 1.049)	0.078	0.809(0.378 ~ 1.731)	0.585
> 55	2(1.52)	50(5.36)	0.313(0.075 ~ 1.311)	0.112	0.323(0.044 ~ 2.398)	0.269
Gender						
Male	79(59.85)	547(58.63)				
Female	23(17.42)	386(41.37)	0.413(0.255 ~ 0.668)	<0.001	0.389(0.233 ~ 0.651)	<0.001
Education level						
Below Bachelor	11(8.33)	123(13.18)				
Bachelor	57(43.18)	479(51.34)	1.331(0.677 ~ 2.614)	0.407	1.425(0.680 ~ 2.987)	0.348
Master or above	34(25.76)	331(35.48)	1.149(0.564 ~ 2.338)	0.702	1.953(0.762 ~ 5.005)	0.163
Professional title						
Primary	24(18.18)	244(26.15)				
Intermediate	57(43.18)	446(47.80)	1.299(0.787 ~ 2.146)	0.306	1.286(0.705 ~ 2.344)	0.412
Senior	21(15.91)	243(26.05)	0.879(0.476 ~ 1.620)	0.679	1.828(0.733 ~ 4.557)	0.196
Hospital Category						
Tertiary hospitals	30(22.73)	431(46.20)				
Secondary hospitals	2(1.52)	98(10.50)	0.293(0.069 ~ 1.248)	0.097	0.364(0.081 ~ 1.632)	0.187
Primary hospitals	2(1.52)	17(1.82)	1.690(0.373 ~ 7.660)	0.496	1.988(0.406 ~ 9.727)	0.396

Factors	Practice		Unadjusted OR(95% CI)	<i>P</i>	Adjusted OR (95% CI)	<i>P</i>
Private hospitals	68(51.52)	387(41.48)	2.524(1.608 ~ 3.963)	<0.001	3.257(1.808 ~ 5.866)	<0.001
Professional working experience (years)						
≤ 10	44(33.33)	394(42.23)				
10–20	42(31.82)	280(30.01)	.1	0.198	1.034(0.581 ~ 1.841)	0.909
20–30	11(8.33)	176(18.86)	0.560(0.282 ~ 1.109)	0.096	0.382(0.129 ~ 1.133)	0.083
>30	5(3.79)	83(8.90)	0.539(0.208 ~ 1.402)	0.205	0.666(0.143 ~ 3.099)	0.605
City						
Large metropolitan areas	9(6.82)	58(6.22)				
Medium-size urban areas	62(46.97)	529(56.70)	0.755(0.357 ~ 1.599)	0.463	0.723(0.321 ~ 1.628)	0.433
Small urban areas	31(23.48)	346(37.08)	0.577(0.261 ~ 1.275)	0.174	0.636(0.259 ~ 1.567)	0.325

Discussion

In this study, we conducted a comprehensive investigation into the situation and attitudes of medical staffs towards the policy of NCDIP. NCDIP was a unique form of dental implant in China which improve the quality of oral services for the people and promote the healthy and orderly development of dental implants through standardizing the charging methods for dental implant medical services and consumables, and strengthening the price control measures for dental implant and other medical services. Medical staffs as the main body implementing medical policies, their attitudes and behaviors were crucial for the implementation of this policy[14]. Our study explored the understanding of dentists towards this policy from three levels: knowledge, attitudes, and practice. This provided important evidence for reflecting the implementation of this policy and understanding the factors that affect its implementation.

In this study, 98.66% of dentists knew the policy of NCDIP, 72.45% of them agreed that they were familiar with this policy. Our funding suggested that most dentists knew this policy through hospital disclosure information which indicated that this policy was well implemented among dentists and most of them

support this policy. Compared to the previous understanding of the policy of centralized drug collection, dentists had a higher awareness of the policy of centralized implant collection[12].

The positive attitude of dentists was considered as an impetus to carrying NCDIP policy out. At the attitude level, our study showed that most dentists believed this policy could reduce the economic burden on patients and doctor-patient disputes and have a significant impact on healthcare reform. Compared to the impact on healthcare reform and doctor-patient relationships, more dentists believed that this policy has a greater impact on reducing patient burden. Price was a direct impact of the policy implementation and an important factor to influence the willing of dental implants for patients[15]. Leung found that most of their subjects were not willing to meet the market price of a dental implant[16]. Actually, it is reported that since the implementation of this policy, the price of dental implants has significantly decreased[17]. Before the collection of dental implants, the average price of domestic implants in 2020 was about 10616 yuan/piece; after centralized harvesting, the average domestic planting price is about 5867 yuan, and the average decrease in planting prices is about 45%[18]. Comprehensive price management has lowered the threshold for people to seek medical treatment, reduced the burden on the public, and made many patients who used to back down at a glance at the price have a strong desire to seek medical treatment[19]. Interestingly, our study found that dentists worked in private hospital were more receptive to the positive impact of this policy. Perhaps because the cost of dental implants in private hospitals is higher than that in public hospitals, the decrease in prices is more noticeable for doctors in private hospitals.

Increasing in knowledge level will change the attitudes, and in turn change the related practices[20; 21]. Our research also found that this policy has a positive impact on changes in dentists' behavior. Above 90% dentists will proactively use dental implants, understand and promote NCDIP policy which suggested that most dentists recognized this policy and practice well. Compared to the implementation of drug procurement policies, NCDIP policy received recognition from the majority of people[22]. The difference of knowledge level has great significance on dentists' practice level, which indicates education intervention is on strategy for better practice This has a positive impact on the implementation of our subsequent policies and healthcare reform[23]. Besides, dentists working in private hospitals experience significant behavioral changes which is consistent with the result of attitude suggesting that cognition and attitudes affect the behaviors[24].

Our study provided data support for exploring KAP of dentists towards NCDIP policies and explored the factors that may influence the implement of this policy which was of great significance for further improving this policy. First, most dentists supported this policy and practice well suggested that NCDIP policy was beneficial for patients and doctor-patient relationships and can continue to advance. Second, we found dentists in public hospitals need to continue to better implement this policy. Besides, in the context of the continuous rise in global dental implant expenditure, it can also provide experience and reference for other countries or regions that need to control dental implant costs.

Conclusions

Overall, most dentists have a good knowledges, attitudes, and practices towards the NCDIP policy. At present, the implementation effect of the policy is good, but in public hospitals, the promotion and implementation of the policy still need to be strengthened.

This was a first study to investigate KAP of dentists about NCDIP policy in China which comprehensively reflects the implementation and impact of this policy. It has great significance for the improvement and perfection of our future policies. However, there were some limitations in our study. First,, this study only involves dentists from tertiary and secondary hospitals in large and

medium cities in Central China, therefore the data could not be generalizable to primary hospitals or hospitals in rural areas. Second, the survey targets only dentists and has not yet investigated the patient's understanding of the policy, which cannot fully reflect the implementation effect of the policy.

Abbreviations

NCDIP

National centralized dental implants procurement

KAP

knowledge, attitude, and practice.

Declarations

Ethics approval and consent to participate

Ethical approval for this study was obtained from Ethical Committee of Changsha Stomatological Hospital. Before starting the survey,each participant was asked to review the aim of the survey and fill out anelectronic informed consent. Participants could withdraw from the survey at any time.

Consent for publication

Not applicable.

Availability of data and materials

The original contribution spresented in the study are included in the article/ Supplementary Material, further inquiries can be directed to the corresponding authors.

Competing interests

All authors declare there's no competing interests and consent to publish the data.

Author's contributions

Conceptualizations, T.X.; methodology, T.X; Validation, L.G.W.J. and B.F.; data collection, L.G., B.F.; formal analysis, B.F. and T.X.; writing—original draft preparation, T.X.; writing—review and editing, B.F. All authors have read and agreed to the published version of the manuscript.

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Figures

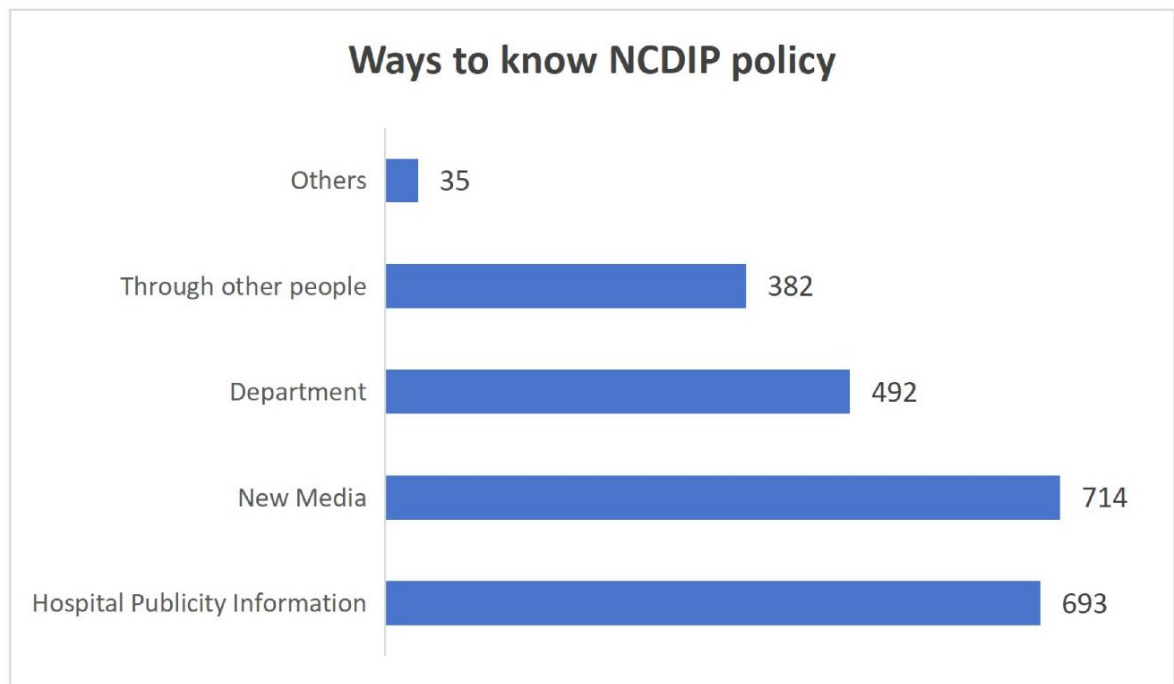


Figure 1

Figure 1

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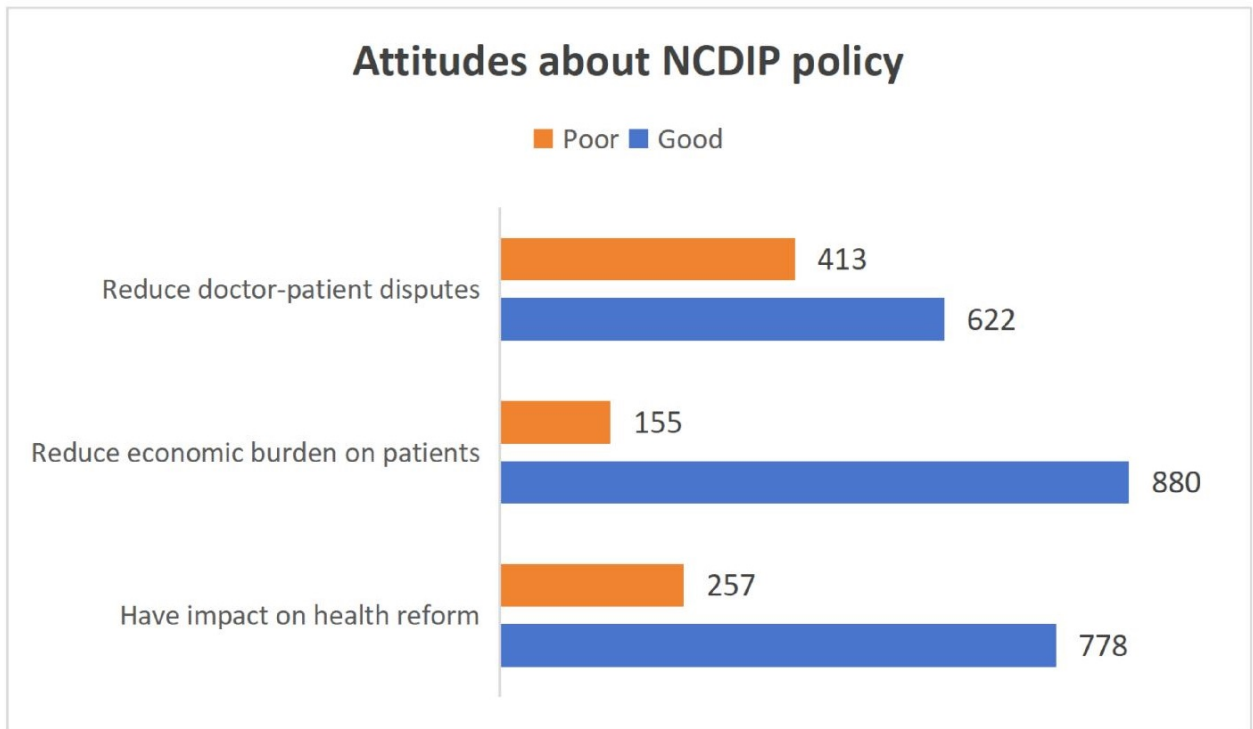


Figure 2

Figure 2

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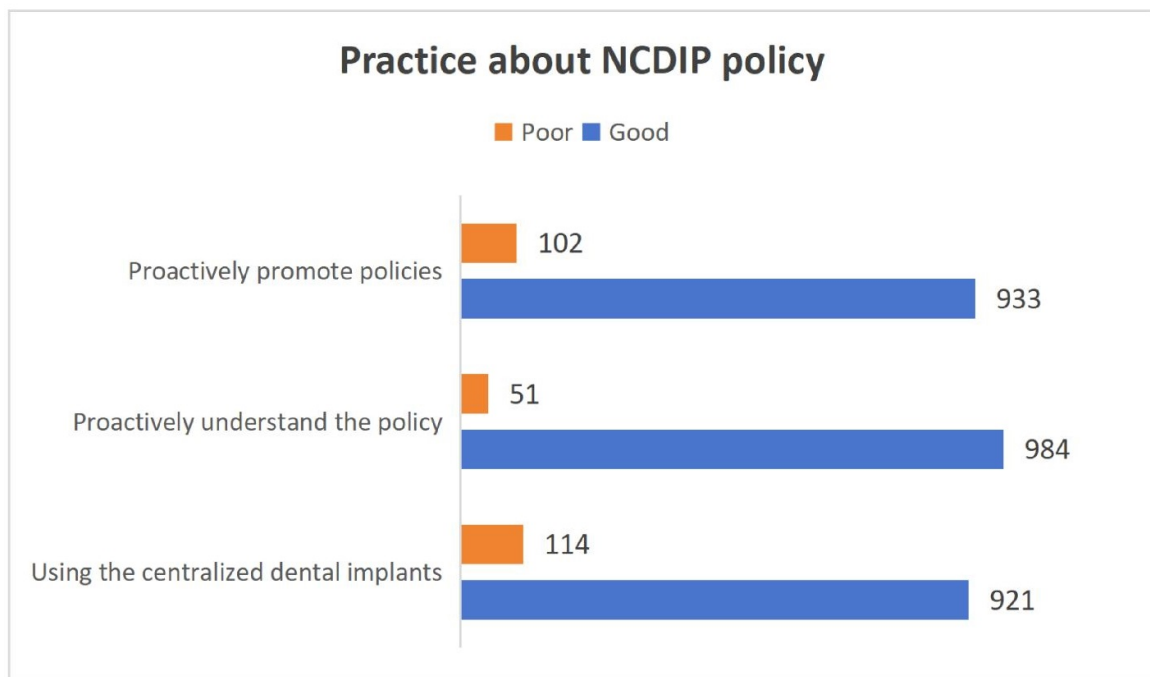


Figure 3

Figure 3

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