

Dental Implant Patients Grouped by the Brinkman Index: Their Attitude toward Smoking, Nicotine Dependence, and Knowledge of Peri-Implantitis

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Abstract

Purpose: This study investigated the attitude of patients, grouped by the Brinkman index, towards smoking by using the Kano Test for Social Nicotine Dependence (KTSND) and their knowledge of peri-implantitis. **Methods:** The participants were 3093 new patients who visited the Tokyo Medical and Dental University Hospital from January 2012 to December 2013 for an oral implant. The methodology included a questionnaire about sex, age, smoking status, daily average number of cigarettes, years of smoking, knowledge of peri-implantitis, and the KTSND. The patients were grouped according to their smoking status by calculating their Brinkman index (over 200 or not): current smokers with the possibility of nicotine dependence (BI(+)_{CS}), current smokers with no possibility of nicotine dependence (BI(-)_{CS}), ex-smokers (ES), and non-smokers (NS). The Brinkman index is obtained by multiplying one's daily average number of cigarettes by the number of years they have been smoking. **Results:** Data were collected from 2182 respondents (response rate = 71%). The KTSND scores of BI(+)_{CS} (16.89 ± 4.26) were significantly higher than the scores of ES (11.99 ± 4.52) and NS (11.53 ± 5.01). In current smokers, there were no significant differences between BI(+)_{CS} and BI(-)_{CS}. The patients replied "I don't know" about peri-implantitis most often in all groups; however, there were no significant differences between the groups. **Discussion:** BI(+)_{CS} were more dependent on nicotine in social situations than the other groups were. In Japan, a Brinkman index over 200 is required for a nicotine-dependence management fee to be instituted for health insurance treatment. This is a major concern for young smokers, who may be excluded from treatment because their years of smoking are substantially less. Results revealed that there were no significant differences between BI(+)_{CS} and BI(-)_{CS}. Therefore, it was suggested that the Brinkman index did not sufficiently group the participants.

Keywords

Dental Implant, Peri-Implantitis, Smoking, Smoking Cessation, Kano Test for Social Nicotine Dependence (KTSND)

1. Introduction

The Health, Labor and Welfare Ministry [1] reported that the smoking rate among males had decreased; the smoking rates in 1965 and 2104 were 82.3% and 30.3%, respectively. The factors involved in this decreased rate were the publication of smoking's harmful effects to health, a decrease in the smoking permitted areas [2], and the increase in tobacco tax imposition [3]. A previous study [4] concerning new patients of a dental implant clinic reported that the smoking rate among male patients was 21.3% and lower than the average rate among males. This indicated that patients, who wanted to receive dental implants, had knowledge of the harmful effects of smoking. Moreover, the smoking rate was affected by occupation and social status [5]. The smoking rate among drivers was much higher than the average (70.6%). One reason might be apathy towards the harmful effects of smoking [6]. Therefore, some patients require more education on smoking's harmful effects and cessation. Smoking cessation medical clinics are increasing gradually and a nicotine-dependence management fee was implemented for health insurance treatment in Japan in 2006. This treatment is permitted if four factors are satisfied: diagnosed with nicotine dependence by the Tobacco Dependence Screener (TDS) [7], a Brinkman index over 200 currently having the desire to quit smoking, and provided informed consent about smoking cessation with the standard procedures for smoking cessation treatment. The Brinkman index is obtained by multiplying one's daily average number of cigarettes by the number of years they have been smoking. Brinkman index over 200 suggested that the patients might have the potential of nicotine dependent in Japan. The treatment includes a smoking cessation lecture and prescription smoking-cessation aid over twelve weeks [8]. The smoking cessation clinic is more common than it was in the past because the treatment is now economical due to the new health insurance. The Central Social Insurance Medical Council [9] reported in 2009 that 3471 patients went to the smoking cessation clinic. Among them, 29.7% patients achieved smoking cessation success. In conclusion, this is important because it leads individuals to have a higher life expectancy and a healthier quality of life (QOL). Smoking is a chronic disease typically accompanied with nicotine dependence [10]. Nicotine is linked together with the $\alpha4\beta2$ receptor, causing dopamine to be discharged as a reward system; therefore, nicotine dependence is very strong [11]. The Kano Test for Social Nicotine Dependence (KTSND) is a test for nicotine dependence [12]. Both smokers and non-smokers can answer the KTSND. It is in the order corresponding to current smokers, ex-smokers, and non-smokers [13]-[17]. The scores change according to various factors such as smoking experience, occupation, and circumstance. A previous study reported that the mean KTSND values were more than 10 points, which was the target value. Therefore, the results indicated a demand for publication to promote smoking cessation. The study groups were sorted by smoking status; however, there might have been a difference between smokers with or without nicotine dependence. This study investigated patients' attitudes after grouping them by smoking status using the Brinkman index.

2. Subjects and Methods

The study participants were patients who visited the Tokyo Medical and Dental University Hospital for dental implants from January 2012 to December 2013. The survey methods included administering questionnaires to patients (without writing down their names), and collecting and analyzing the data. The questionnaires included information about sex, age, smoking experience, daily average number of cigarettes, years of smoking, knowledge of peri-implantitis, and the KTSND. The patients were grouped by smoking status and the Brinkman index (over 200 or not): the brinkman index over 200 and current smokers (BI(+)*CS*), brinkman index under 200 and current smokers (BI(-)*CS*), ex-smokers (*ES*), and non-smokers (*NS*). KTSND (version 2.1) is composed of 10 questions that reflect 3 factors: the smoker's attempt to undervalue the harm caused by smoking (questions 1, 9, and 10); to overvalue the favorable effects of smoking (questions 6, 7, and 8); and to justify smoking as an acceptable cultural and social behavior (questions 2, 3, 4, and 5). The survey is scored on a 4-point Likert scale with responses "definitely yes", "probably yes", "probably no", and "definitely no" scored as 3, 2, 1, and 0, re-

spectively (except for question 1, which was scored in reverse order). The individual scores for each question are added to give a total KTSND score that ranges from 0 to 30, with higher scores indicating a greater social dependence on nicotine, and that smoking is acceptable and justifiable. The desired KTSND score is 9 [18] [19]. The patients, who did not reply to all questions perfectly, were excluded. The KTSND scores were compared between BI(+)*CS*, BI(-)*CS*, ES, and NS by using the Games-Howell test. KTSND responses were compared between the participants by using the Tukey test or the Games-Howell test. The statistical software package PASW Statistics version 18.0.0 (SPSS Inc. SPSS Japan) was used for all statistical analyses. The statistical level of significance was set at $p < 0.05$. The survey was conducted in accordance with the guidelines of the ethics committee at Tokyo Medical and Dental University (accepted December 05, 2011; accepted No. 733).

3. Result

3.1. Patient Characteristics (Table 1)

The questionnaire was distributed to 3093 patients and we achieved 2648 respondents (collection rate = 86%) and 2182 respondents (response rate = 71%). The mean age of participants was 53.1 years, and there were approximately twice as women than men. The highest proportions of participants were aged 50 - 59 years (28%), followed by those aged 60 - 69 years (28%), 40 - 49 years (19%), 30 - 39 years (11%), 70 - 79 years (8%), 20 - 29 years (5%), 80 - 89 years (1%), and 10 - 19 years (1%). BI(+)*CS* comprised 177 patients (8%), BI(-)*CS* comprised 98 patients (5%), ES comprised 463 patients (21%), and NS comprised 1445 patients (66%). The highest proportion of BI(+)*CS* was aged 30 - 39 years (32%), followed by those aged 40 - 49 years (27%), 50 - 59 years (22%), 20 - 29 (17%) years, and 60 - 69 years (2%).

3.2. KTSND Scores (Table 1)

The mean KTSND scores of the BI(+)*CS*, BI(-)*CS*, ES, and NS were 16.89 ± 4.26 , 14.29 ± 3.50 , 11.99 ± 4.52 , and 11.53 ± 5.01 , respectively. The KTSND scores of BI(+)*CS* were significantly higher than the scores of the ES and NS were. For question 1, there were significant differences between BI(+)*CS* and ES, and BI(+)*CS* and NS. For question 3, there were significant differences between BI(+)*CS* and ES, and BI(+)*CS* and NS. For question 4, there were significant differences between BI(+)*CS* and ES, BI(+)*CS* and NS, BI(-)*CS* and ES, and BI(-)*CS* and NS. For question 5, there were significant differences between BI(+)*CS* and ES, and BI(+)*CS* and NS. For question 6, there were significant differences between BI(+)*CS* and ES, and BI(+)*CS* and NS. For question 7, there were significant differences between BI(+)*CS* and ES, and BI(+)*CS* and NS. For question 8, there were significant differences between BI(+)*CS* and BI(-)*CS*, BI(+)*CS* and ES, and BI(+)*CS* and NS. For question 9, there were significant differences between BI(+)*CS* and BI(-)*CS*, BI(+)*CS* and ES, BI(+)*CS* and NS, BI(-)*CS* and ES, and BI(-)*CS* and NS. For question 10, there were significant differences between BI(+)*CS* and ES, and BI(+)*CS* and NS.

3.3. Knowledge of Peri-Implantitis (Table 1)

Regarding peri-implantitis, the most common reply of all groups was, "I do not know.", Bi(+)*CS*, BI(-)*CS*, ES, and NS were 35 (20%), 29 (30%), 83 (18%), and 376(26%) , respectively. There were no significant differences between all groups.

4. Discussion

In the past, people could smoke on airplanes and trains. Then the Health, Labor, and Welfare Ministry reported the adverse effect of second-hand smoking [20]. The adverse effect of smoking, including second-hand smoking, was considered to negatively affect health significantly [12]. Therefore, the areas where smoking was permitted have decreased and tobacco tax has increased. Because of social, economic, and health situations, 70% of current smokers desired smoking cessation [21]. However, smoking cessation is not easy because smoking is typically accompanied by nicotine dependence [13]. Therefore, health professionals have a duty to smoking's adverse effects public to encourage smokers' motivation to quit [22].

Smoking causes many health problems. Importantly, one problem is that the amount of oxygen in the blood decreases because carbon monoxide has a strong affinity for hemoglobin. Therefore, smokers often develop

Table 1. Patients' characteristics including KTSND score and their knowledge of peri-implantitis.

	Total		Brinkman index over 200 and current smokers (BI(+))CS)		Brinkman index under 200 and current smokers (BI(-))CS)		Ex-smokers (ES)		Non-smokers (NS)	
All participants	3093		252.31		133.89		617.3		2089.5	
Collection number (%)	2648	(86)	214.46	(85)	117.82	(88)	512.4	(83)	1880.6	(90)
Response number (%)	2182	(71)	176.62	(70)	97.739	(73)	463	(75)	1445	(70)
Rate in total number %	100		8		5		21		66	
Mean age \pm SD	53.1 \pm 15.7		51 \pm 14.3		46.1 \pm 19.6		55.0 \pm 18.4		55 \pm 28.2	
Age group (year, %)										
10 - 19	12	(1)	0	(0)	2	(2)	0	(0)	10	(1)
20 - 29	104	(5)	29	(7)	7	(7)	5	(1)	63	(4)
30 - 39	246	(11)	56	(32)	19	(19)	38	(8)	134	(9)
40 - 49	418	(19)	47	(27)	26	(26)	94	(20)	250	(17)
50 - 59	615	(28)	40	(22)	38	(39)	128	(28)	409	(28)
60 - 69	603	(28)	4	(2)	7	(7)	171	(37)	421	(29)
70 - 79	173	(8)	0	(0)	0	(0)	26	(6)	147	(10)
80 - 89	14	(1)	0	(0)	0	(0)	2	(0)	12	(1)
Men (%)	622	(33)	113	(64)	33	(33)	170	(37)	307	(21)
Women (%)	1559	(67)	63	(36)	65	(67)	293	(63)	1137	(79)
Knowledge of peri-implantitis (%)										
I know.	524	(24)	35	(20)	29	(30)	83	(18)	376	(26)
I do not know in detail.	536	(24)	46	(26)	14	(14)	130	(28)	347	(24)
I do not know.	1123	(52)	95	(54)	55	(56)	250	(54)	723	(50)
KTSND \pm SD										
Q 1: Smoking itself is a disease	1.21 \pm 0.66		1.72 \pm 0.86	^{*2*} 3	1.31 \pm 0.95		1.27 \pm 0.96	^{*2}	1.15 \pm 0.94	^{*3}
Q 2: Smoking is a part of the culture	1.44 \pm 1.02		1.33 \pm 0.78		1.24 \pm 0.68		1.23 \pm 0.75		1.13 \pm 0.77	
Q 3: Tobacco is one of life's pleasures	2.01 \pm 1.04		1.86 \pm 0.6	^{*2*} 3	1.48 \pm 0.63		1.38 \pm 0.66	^{*2}	1.36 \pm 0.69	^{*3}
Q 4: Smokers' lifestyles may be respected	1.46 \pm 0.92		1.79 \pm 0.69	^{*2*} 3	1.61 \pm 0.6	^{*4*} 5	1.17 \pm 0.71	^{*2*} 4	1.07 \pm 0.74	^{*3*} 5
Q 5: Smoking sometimes enriches people's lives	1.44 \pm 0.92		1.61 \pm 0.62	^{*2*} 3	1.39 \pm 0.68		1.25 \pm 0.74	^{*2}	1.22 \pm 0.8	^{*3}
Q 6: Tobacco has positive physical or mental effects	1.26 \pm 0.9		1.69 \pm 0.73	^{*2*} 3	1.24 \pm 0.73		1.17 \pm 0.81	^{*2}	1.05 \pm 0.78	^{*3}
Q 7: Tobacco has stress-relieving effects	1.6 \pm 0.87		2.1 \pm 0.63	^{*2*} 3	1.84 \pm 0.7		1.6 \pm 0.74	^{*2}	1.51 \pm 0.82	^{*3}
Q 8: Tobacco enhances the function of smokers' brains	0.98 \pm 0.82		1.53 \pm 0.7	^{*1*} 2*3	0.71 \pm 0.61	^{*1}	0.86 \pm 0.72	^{*2}	0.9 \pm 0.73	^{*3}
Q 9: Doctors exaggerate the ill effects of smoking	0.91 \pm 0.85		1.49 \pm 0.76	^{*1*} 2*3	1.01 \pm 0.68	^{*1*} 4*5	0.68 \pm 0.69	^{*2*} 4	0.68 \pm 0.69	^{*3*} 5
Q 10: People can smoke at places where ashtrays are available	2.15 \pm 1		1.72 \pm 0.54	^{*2*} 3	1.52 \pm 0.62		1.34 \pm 0.6	^{*2}	1.41 \pm 0.41	^{*3}
Total score	14.49 \pm 4.71		16.89 \pm 4.25	^{*2*} 3	14.29 \pm 3.49		11.99 \pm 4.51	^{*2}	11.53 \pm 5.01	^{*3}

^{*1}: The KTSND score of BI(+))CS was significantly higher than was that of BI(-))CS ($p < 0.05$).

^{*2}: The KTSND score of BI(+))CS was significantly higher than was that of ES ($p < 0.05$).

^{*3}: The KTSND score of BI(+))CS was significantly higher than was that of NS ($p < 0.05$).

^{*4}: The KTSND score of BI(-))CS was significantly higher than was that of ES ($p < 0.05$).

^{*5}: The KTSND score of BI(-))CS was significantly higher than was that of NS ($p < 0.05$).

polycythemia as the blood become more viscous. Consequently, the situation causes protracted wound healing, as there is a low supply of oxygen to tissue [23] [24]. Therefore, smoking is a risk factor for peri-implantitis [16]. In this study, all groups lacked sufficient education on the link between smoking and peri-implantitis. Moreover, a low-risk dental implant treatment increased the QOL of patients [25] and active instruction concerning smoking cessation was related to a healthier life expectancy.

The use of the Brinkman index in this study is viewed with suspicion because young people could have been excluded [26]. Moreover, there is no defined method for determining nicotine dependence. Therefore, the KTSND test is suggested as an appropriate test for nicotine dependence [12]. In this study, the total KTSND score for BI(+)-CS and BI(-)-CS was significantly higher than it was for ES and NS. This may indicate the possibility that patients were missed for nicotine dependence treatment. Therefore, we suggest an expansion of the education towards smoking cessation treatment.

When comparing each KTSND question, with the exception of question 2, all questions showed significant differences between BI(+)-CS and ES, and BI(+)-CS and NS. Questions 4 and 9 had significant differences between BI(-)-CS and ES, and BI(-)-CS and NS. This revealed that ES and NS had awareness about the adverse effects of smoking. Only questions 8 and 9 had significant differences between BI(+)-CS and BI(-)-CS. If BI(-)-CS is not accompanied with nicotine dependence, the results may be significantly different between BI(+)-CS and BI(-)-CS and similar values may be seen between BI(-)-CS, ES, and NS. These results suggested there might be the possibility of missed patients when grouped by the Brinkman index.

5. Conclusion

BI(+)-CS must be educated on smoking cessation because they accepted smoking more than the other groups did. However, BI(-)-CS showed similar trends with BI(+)-CS. Additional investigation is needed for adequate diagnosis.

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