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The effects of the number of natural teeth and posterior occluding pairs on the oral health-related quality of life in elderly dental patients

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Objectives: To compare between the oral health-related quality of life (OHRQoL) of Thai elderly dental patients at the Faculty of Dentistry, Chulalongkorn University with at least 20 natural teeth (NT) and those with less than 20 NT, and between those with at least 4 posterior occluding pairs (POP) and those with less than 4 POP.
Background: Thai government recommended that elderly people should have at least 20 NT and 4 POP.
Materials and methods: The participants comprised 240 Thai elderly dental patients who were interviewed and had their OHRQoL determined using the Oral Impacts on Daily Performances Index (OIDP). Higher OIDP score indicates poorer OHRQoL. We counted the functional NT and POP in each participant.
Results: Participants with less than 20 NT or less than 4 POP had significantly higher OIDP scores than those with at least 20 NT or at least 4 POP. Moreover, when we evaluated one by one tooth loss, we found the first and the last significant differences between the OIDP scores in the participants with at least 23 teeth and with less than 23 teeth, and those in the participants with at least 5 teeth and with less than 5 teeth, in consequently.
Conclusion: Thai elderly participants with at least 20 NT or at least 4 POP had greater OHRQoL than those with less than 20 NT or less than 4 POP, and in our study sample, we observed that 5 teeth may be an important clinical threshold for Thai elderly dental patients' quality of life.

Keywords: elderly dental patients, number of natural teeth, number of posterior occluding pairs, oral health-related quality of life.

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Introduction

Thailand is currently facing a rapid increase in the percentage of the elderly population. According to the Act on Older Persons B.E. 2546 (2003 A.D.), Thai elderly means 'persons who have attained the age of at least sixty years and are of Thai nationality'[1]. In 2007, individuals who were at least 60 years old comprised 10.7% of the total Thai population[2]. Oral problems commonly found in the elderly include tooth loss, dental caries, periodontal disease, xerostomia and oral pre-cancer/cancer[3]. Severe dental caries and periodontal disease are the major reasons for tooth loss in the elderly[3–6]. The 6th National Oral Health Survey in Thailand 2006–2007 reported that tooth loss was the most common oral condition in elderly Thais with an average of 13.38 teeth lost per person[7].

Several organizations have stated goals for the number of retained natural teeth (NT) in the elderly. The World Health Organization (WHO) proposed that people should have at least 20 NT[8]. The World Dental Federation (FDI) recommended that 50% of individuals aged 65 years and above should have 20 or more teeth[9]. In Thailand, the Ministry of Public Health proposed a goal of the elderly having at least 20 NT and 4 posterior occluding pairs (POP)[10].

There has been increasing awareness of the importance of oral health-related quality of life (OHRQoL), which characterizes people's perceptions of their oral health[11], by oral health

professionals. It is believed that clinical measures alone reflect only one aspect of oral health status, but do not reflect a full picture of oral health nor indicate whether people can perform daily activities properly[12–14]. Moreover, the quality of life should come from subjective assessment, not come from normative assessment[15]. Therefore, increased attention has been given to consider how oral conditions affect quality of life[16]. There are several OHRQoL indicators that reveal the oral health conditions impacting quality of life such as the General Oral Health Assessment Index (GOHAI), the Oral Health Impact Profile (OHIP) and the Oral Impacts on Daily Performances Index (OIDP)[17].

The OIDP was developed by Adulyanon and Sheiham[17,18]. This questionnaire measures if patient's oral conditions have had serious impacts on daily activities in the past 6 months. The OIDP consists of eight daily activities representing physical, psychological and social dimensions: (i) eating and enjoying food, (ii) speaking and pronouncing clearly, (iii) cleaning teeth, (iv) carrying out major work or social role, (v) sleeping and relaxing, (vi) maintaining usual emotional state without being irritable, (vii) smiling, laughing and showing teeth without embarrassment, and (viii) enjoying contact with people[17,18]. The OIDP can be used to survey, to evaluate the dental treatment needs, to plan the dental treatment needs in populations and to evaluate dental treatment outcomes[17–19]. When people report that their oral conditions have had impacts on these lifestyle parameters, they are asked to specify the main symptoms (pain, discomfort, functional limitation, and dissatisfaction with appearance) and main oral problems (such as tooth loss and toothache)[18,19]. The Thai version of the OIDP has acceptable psychometric properties[17,18].

The objectives of this study were to compare the OHRQoL of Thai elderly dental patients at the Faculty of Dentistry, Chulalongkorn University who had at least 20 NT with those who had less than 20 NT, and to compare the OHRQoL of these patients who had at least 4 POP with those who had less than 4 POP.

Materials and methods

This study was cross-sectional study. The study protocol was approved by the Ethical Committee of Chulalongkorn University (Study Code: HREC-DCU 2011031). Two hundred and forty Thai elderly dental patients who were being treated in the Graduate Prosthodontic Clinic at the Faculty of Dentistry, Chulalongkorn University from May 2011 to June 2012, and met the following criteria were invited to participate in this study:

1. Were at least 60 years old on the day they entered the study.
2. Were current patients in the Graduate Prosthodontic Clinic at any stage of treatment prior to prosthesis insertion or delivery.
3. Were healthy or with controlled systemic diseases.
4. Did not suffer from psychiatric problems or depression.

The enrolled participants were interviewed about their demographic information, medical history, removable denture wearing history, and were assessed the OHRQoL in the past 6 months using the OIDP questionnaire. We next examined the patients and counted the number of functional NT, consisting of pathology-free teeth, teeth with pathology that were restorable, and restored teeth. We next determined the number of POP using shimstock film (Bausch Arti-Fol® metallic Shimstock-Film-12 microns). If any of the participants were wearing removable dentures, we determined the number of POP while the dentures were in place.

Oral Impacts on Daily Performances Index data were collected on the significant impacts of the participants' oral health condition on their ability to perform eight daily activities (eating and enjoying food, speaking and pronouncing clearly, cleaning teeth, carrying out major work or social role, sleeping and relaxing, maintaining usual emotional state without being irritable, smiling, laughing and showing teeth without embarrassment, and enjoying contact with other people) about

1. *frequency scores* of the impacts (ranging from 0 to 5: shown in Table 1): The consideration of the frequency score of OIDP has two patterns based on the problem occurrence. Firstly, if the problems occur regularly, repeatedly and continuously within the past 6 months, the frequency score will be recorded by the frequency of the problem occurrence. It is called 'regular pattern'. Secondly, if the problems occur once and disappear, and do not repeat again within the past 6 months, the frequency score will be recorded by the duration of the problem occurrence. It is called 'spell pattern'. Noted that the frequency score of OIDP can only be considered using either 'regular pattern' or 'spell pattern'[17,18].
2. *severity scores* of the impacts (ranging from 0 to 5: shown in Table 1)

Table 1 The patterns of frequency score and severity score of the Oral Impacts on Daily Performances (OIDP)[17,18].

	Frequency score		
Score	*Frequency of the problem occurrence (Regular pattern)*	*Duration of the problem occurrence (Spell pattern)*	*Severity score*
0	Never affected in past 6 months	0 day	None
1	Less than once a month	1–5 days	Much less severe
2	Once or twice a month	6–15 days	Less severe
3	Once or twice a week	16–30 days	Moderately severe
4	3–4 times a week	1–3 months	Severe
5	Every or nearly every day	Over 3 months	Very severe

3. *major symptoms* (pain, discomfort, functional limitation, and dissatisfaction with appearance)
4. *main oral impairments* (such as tooth loss and toothache)[17,18].

The OIDP score for each activity in the present study was calculated by multiplying the frequency score by the severity score (ranging from 0 to 25). The total score was the sum of the activity scores (ranging from 0 to 200)[17,18]. The higher OIDP score indicates the poorer OHRQoL[16–18].

The data were analysed using the Statistics Package for the Social Sciences (SPSS), version 17.0 (SPSS (Thailand) Co., Ltd., Bangkok, Thailand). Statistical analyses were performed using the descriptive statistics, Mann–Whitney *U*-test and Monte Carlo test. Statistical significance was set at the 5% level ($p < 0.05$). All procedures in the study were performed by the only one investigator.

Results

The characteristics of participants

The participants in the present study comprised 108 (45%) males and 132 (55%) females. The age of participants ranged from 60 to 93 years old with an average age of 69.3 ± 7.0 years. Nearly, all (94.2%) of the participants were able to read and write. Eighty per cent of the participants had at least one systemic disease. The most common systemic disease was hypertension (42.5%), followed by hyperlipidemia (35%), bone disease (27.9%), diabetes (18.8%), cardiovascular disease (12.5%), cancer (4.6%), and stroke (2.5%). The vast majority (96.7%) of the participants had not undergone head and neck radiation and/or chemotherapy. The denture wearing history of the participants is seen in Table 2. A majority of the participants (59.6%) wore removable dentures, and 77.6% of these experienced denture problems. Ill-fitting dentures (48.7%) and reduced/non-occluding occlusal surfaces of the dentures (18.8%) were the most commonly reported problems.

The minimum and maximum numbers of NT found in the participants were 0 and 32 teeth, respectively. The average number of NT was 13.0 ± 9.5 teeth. Seventy-six participants (31.7%) had at least 20 teeth, and 164 participants (68.3%) had less than 20 teeth. Sixty participants (25%) were completely edentulous. Moreover, the minimum and maximum numbers of POP in our participants were 0 and 10 pairs, respectively. The average number of POP was 3.5 ± 2.7 pairs. One hundred and sixteen participants (48.3%) had at least 4 POP, and 124 participants (51.7%) had less than 4 POP.

The daily performances impacted by oral problems, main symptoms and main oral impairments causing oral impacts

We found that 139 participants (57.9%) had at least one daily activity impacted by serious oral problems during the past 6 months. Eating (49.6%) and speaking (21.3%) were the most commonly reported activities affected by oral

Table 2 The denture wearing history of the participants.

Characteristics	*n*	%
Removable denture wearing		
Never	52	21.7
Ex wearer	45	18.8
Current wearer	143	59.6
No denture problems	32	22.4
Have denture problems	111	77.6
Removable denture problems		
Ill-fitting denture	75	48.7
Poor occlusion (unsharpened/worn teeth)	29	18.8
Extracted natural teeth	20	13.0
Broken denture part(s)	18	11.7
Poor esthetics	6	4.0
Pain	4	2.6
Broken abutment	2	1.3

problems. No participants had difficulty carrying out major work. Functional limitation was the main symptom for the problems of eating (73.6%), speaking (98.2%) and maintaining their usual emotional state (55.2%). Dissatisfaction with appearance was the main symptom for the problems of smiling (100%) and enjoying contact with people (75%). Pain was the main symptom for the problems of cleaning teeth (53.3%) and sleeping (77.8%). Ill-fitting denture and tooth loss were most common main oral impairments for almost all daily activities (Table 3).

Table 3 The daily performances impacted by oral problems, main symptoms, and main oral impairments

Daily performances	*Main symptoms % (n)*		*Main oral impairments % (n)*	
1. Eating (n = 119, 49.6%)	Functional limitation	73.6 (103)	Ill-fitting denture	48.1 (64)
	Pain	23.6 (33)	Tooth loss	40.6 (54)
	Discomfort	2.9 (4)	Tooth fracture	2.2 (3)
			Poor occlusion	2.2 (3)
			Tooth sensitivity	1.5 (2)
			Tooth mobility	1.5 (2)
			Loss of filling	1.5 (2)
			Dry mouth	0.8 (1)
			Tooth pain	0.8 (1)
			Gingivitis	0.8 (1)
2. Speaking (n = 51, 21.3%)	Functional limitation	98.2 (54)	Ill-fitting denture	44.4 (24)
	Discomfort	1.9 (1)	Tooth loss	38.9 (21)
			Wearing denture	14.8 (8)
			Dry mouth	1.9 (1)
3. Cleaning teeth (n = 15, 6.3%)	Pain	53.3 (8)	Tooth spacing	40 (6)
	Functional limitation	46.7 (7)	Gum pain	13.3 (2)
			Tooth wear	13.3 (2)
			Crowding	13.3 (2)
			Tooth sensitivity	6.7 (1)
			Tooth loss	6.7 (1)
			Wearing denture	6.7 (1)
4. Carrying out major work (n = 0)	–		–	
5. Sleeping (n = 8, 3.3%)	Pain	77.8 (7)	Tooth pain	66.7 (6)
	Functional limitation	11.1 (1)	Tooth loss	11.1 (1)
	Discomfort	11.1 (1)	Dry mouth	11.1 (1)
			Bruxism	11.1 (1)
6. Maintaining usual emotional state (n = 26, 10.8%)	Functional limitation	55.2 (16)	Ill-fitting denture	50 (13)
	Pain	27.6 (8)	Tooth loss	30.8 (8)
	Discomfort	13.8 (4)	Tooth pain	3.8 (1)
	Dissatisfaction with appearance	3.4 (1)	Dry mouth	3.8 (1)
			Tooth mobility	3.8 (1)
			Gingivitis	3.8 (1)
			Food impaction	3.8 (1)
7. Smiling (n = 39, 16.3%)	Dissatisfaction with appearance	100 (39)	Tooth loss	65 (26)
			Poor natural teeth esthetics	10 (4)
			Poor denture esthetics	10 (4)
			Ill-fitting denture	10 (4)
			Wearing denture	5 (2)
8. Enjoying contact with people (n = 20, 8.3%)	Dissatisfaction with appearance	75 (18)	Tooth loss	55 (11)
	Functional limitation	25 (6)	Ill-fitting denture	25 (5)
			Wearing denture	10 (2)
			Poor esthetics	5 (1)
			Wearing denture	5 (1)

The relationship between the number of functional NT and the OIDP scores

The Thai Ministry of Public Health has set a goal of elderly persons having at least 20 NT. We found that there were significant differences between the OIDP scores of the participants with at least 20 NT and those of the participants with less than 20 NT, in case of the total OIDP score ($p = 0.001$), the OIDP scores concerning eating problem ($p = 0.003$) and speaking problem ($p = 0.006$; Table 4). These results indicated that the participants who had at least 20 teeth had higher OHRQoL than those who had less than 20 teeth. However, there was no statistically significant association overall between the number of functional NT and the total OIDP score as analysed using the Monte Carlo test ($p = 0.363$).

Moreover, we sequentially evaluated the effect of tooth loss on the total OIDP score from 32 teeth down to 0 teeth (Fig. 1). The results showed that from 0 to 8 teeth lost, that is, 32 to 24 remaining teeth, there were no significant differences between the total OIDP scores. The first significant difference ($p = 0.028$) was found between the total OIDP score of participants with at least 23 teeth (10.07) and those with less than 23 teeth (15.57). There were significant differences between the total OIDP scores from 23 to 5 remaining teeth. The last difference ($p = 0.032$) was found between the total OIDP score of participants with at least 5 teeth (12.71) and those with less than 5 teeth (19.18). There were no significant differences between the total OIDP scores from 4 to 0 remaining teeth.

We categorized the participants into three groups based on the aforementioned results: high remaining group (23–32 remaining teeth), moderate remaining group (5–22 remaining teeth), and low remaining group (0–4 remaining teeth). Their characteristics were shown in Table 5. The percentage of the participants who had at least one daily performance problem in high, moderate, and low remaining group were 43.5, 56.7, and 70.1, respectively. Eating problem was the most reported problem in all groups, followed by smiling problem in high remaining group, speaking and smiling problems in moderate remaining group, and speaking problem in low remaining group.

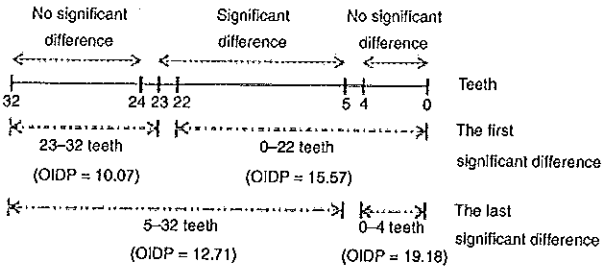

Figure 1 The diagram of the total Oral Impacts on Daily Performances (OIDP) scores evaluated sequentially from 32 teeth to 0 teeth.

The relationship between the number of POP and the OIDP scores

The Thai Ministry of Public Health has proposed that the elderly should have at least 4 POP. We found that there were significant differences between the OIDP scores of the participants with at least 4 POP and those of the participants with less than 4 POP, in case of the total OIDP score ($p < 0.001$), the OIDP scores concerning eating

Table 4 The relationship between the number of functional natural teeth, the number of posterior occluding pairs, and the Oral Impacts on Daily Performances (OIDP) scores.

	The number of functional natural teeth			*The number of posterior occluding pairs*		
	OIDP scores			*OIDP scores*		
Daily performances	*≥20 teeth*	*<20 teeth*	*p-value*	*≥4 pairs*	*<4 pairs*	*p-value*
Total OIDP	9.38	16.89	0.001*	9.04	19.63	<0.001*
Eating	4.55	7.85	0.003*	5.09	8.41	0.001*
Speaking	1.21	3.30	0.006*	1.56	3.65	0.005*
Cleaning teeth	0.76	0.58	0.496	0.26	0.99	0.005*
Sleeping	0.79	0.26	0.251	0.43	0.43	0.550
Maintaining usual emotional state	0.66	1.25	0.155	0.78	1.32	0.279
Smiling	1.32	2.35	0.188	0.67	3.28	<0.001*
Enjoying contact with people	0.49	1.36	0.220	0.24	1.87	0.002*

*$p < 0.05$; Mann–Whitney U-test.

problem ($p = 0.001$), speaking problem ($p = 0.005$), cleaning problem ($p = 0.005$), smiling problem ($p < 0.001$), and contacting with people problem ($p = 0.002$; Table 4). These results indicated that the participants with at least 4 POP had higher OHRQoL than those with less than 4 POP. However, there was no statistically significant association overall between the number of POP and the total OIDP score when analysed using the Monte Carlo test ($p = 0.725$).

The relationship between removable denture wearing and the OIDP scores

We found that there were no significant differences between the OIDP scores of participants with removable dentures and those of the participants without removable dentures (Table 6). We next examined the relationship between removable denture problems and the OIDP scores of the participants with removable dentures. The results indicated that there were significant differences between the OIDP scores of the participants with denture problems and those of the participants without denture problems, in case of the total OIDP score ($p < 0.001$), the OIDP scores concerning eating problem ($p < 0.001$), speaking problem ($p = 0.011$), and maintaining usual emotional state problem ($p = 0.029$; Table 6). These findings indicated that the participants without denture problems had higher OHRQoL than those with denture problems.

Discussion

When compared the number of NT and the number of POP in this study with those in the 6th National Oral Health Survey in 2006–2007[7], we

Table 5 The characteristics of the participants in high, moderate, and low remaining group.

Characteristics	*High remaining*	*Moderate remaining*	*Low remaining*
Total participants [*n* (%)]	46 (19.2)	127 (52.9)	67 (27.9)
Male [*n* (%)]	20 (43.5)	61 (48.0)	27 (40.3)
Female [*n* (%)]	26 (56.5)	66 (52.0)	40 (59.7)
Age [years old]	60–80	60–93	60–86
Average age [years old ± SD]	65.43 ± 5.27	69.14 ± 7.04	72.15 ± 6.90
Affected at least 1 daily performance [*n* (%)]	20 (43.5)	72 (56.7)	47 (70.1)
Eating problem [*n* (%)]	16 (34.8)	63 (49.6)	40 (59.7)
Speaking problem [*n* (%)]	5 (10.9)	22 (17.3)	24 (35.8)
Cleaning problem [*n* (%)]	4 (8.7)	10 (7.9)	1 (1.5)
Sleeping problem [*n* (%)]	2 (4.3)	6 (4.7)	0 (0)
Maintaining emotional state problem [*n* (%)]	4 (8.7)	12 (9.4)	10 (14.9)
Smiling problem [*n* (%)]	6 (13.0)	22 (17.3)	11 (16.4)
Enjoying contact with people problem [*n* (%)]	1 (2.2)	11 (8.7)	8 (11.9)

Table 6 The relationship between removable denture wearing, removable denture problems, and the Oral Impacts on Daily Performances (OIDP) scores.

	Removable denture wearing			*Removable denture problems*		
	OIDP scores			*OIDP scores*		
Daily performances	*Do not wear*	*Wear*	*p-value*	*Do not have*	*Have*	*p-value*
Total OIDP	15.55	13.81	0.923	4.69	16.44	<0.001*
Eating	6.71	6.87	0.941	2.19	8.23	<0.001*
Speaking	2.55	2.70	0.645	0.59	3.31	0.011*
Cleaning teeth	1.05	0.36	0.089	0	0.45	0.278
Sleeping	0.74	0.22	0.190	0.50	0.14	0.067
Maintaining usual emotional state	1.03	1.08	0.841	0	1.40	0.029*
Smiling	2.61	1.62	0.130	0.78	1.86	0.194
Enjoying contact with people	1.26	0.97	0.384	0.63	1.06	0.349

*$p < 0.05$; Mann–Whitney U-test.

found that the average number of NT, the percentage of people who had at least 20 NT and the percentage of people who had at least 4 POP in this study (13 teeth, 31.7%, and 48.3%, respectively) were less than those in the national survey (18.1 teeth, 54.8%, and 77.6%, respectively). Moreover, in our study, the percentage of participants who were completely edentulous (25%) was higher than that of the national survey (10.47%). These differences may be because the participants in our study were patients in the Graduate Prosthodontic Clinic at the Faculty of Dentistry, Chulalongkorn University and were thus seeking dental care. This may have resulted in a study population that had greater dental care needs and a higher proportion of participants without teeth than is present in the general public. Additionally, the majority of the study participants lived in an urban setting where the consumption of foods that cause dental caries such as soft drinks, sweets, and candy are common. If dental caries is untreated, this can result in tooth loss. We assumed that the majority of the participants were urban dwellers because this clinic was conducted in an urban setting. However, the average number of POP in the present study (3.5 pairs) was approximately that found in the national survey (3.27 pairs).

We found that 57.9% of the participants had at least one daily activity impacted by serious oral problems during the past 6 months. This finding was quite similar to the previous studies in elderly Thais of Gherunpong *et al.* (51.3%)[15], Srisilapanan *et al.* (52.8%)[19], and Krisdapong *et al.* (53.6%)[20]. As in previous studies[19–24], difficulty in eating was the most commonly reported problem. In the present study, the percentage of participants experiencing eating problem (49.6%) was double that of participants who had speaking problem (21.3%), which was the second most commonly reported problem. This suggests that prosthodontic treatment should mainly focus on improving patients' OHRQoL in eating and enjoying food. For example, a two-implant retained mandibular overdenture should be the treatment of choice for a completely edentulous mandible[25] because this can improve chewing ability compared with a conventional mandibular complete denture and increase the quality of life[26]. Moreover, choosing easy-to-chew food and cutting food into small pieces are also necessary. There are many kinds of food that are suitable for complete denture wearers[27]. Furthermore, similar to the study of Srisilapanan *et al.*[19], we found that functional limitation was the most common main symptom relating to oral problems impacting on daily activities, and tooth loss was the major main oral problem in that regard.

When considering the relationship between the number of functional NT and OHRQoL based on the goal of the Thai Ministry of Public Health, we found that the participants with at least 20 NT had a significantly higher OHRQoL than those with less than 20 NT, in case of overall dimension (total OIDP) and physical dimension (eating and speaking). These findings are similar to previous studies[28–32].

By the way, the result showed that the participants in at least 20 teeth group had more problems in cleaning teeth (higher OIDP score) than those in less than 20 teeth group. It might be because the higher the number of NT, the more difficulty in cleaning teeth. The causes of problems might be tooth spacing, tooth wear, crowding and tooth sensitivity. Moreover, our results showed that participants with at least 20 NT had more problems in sleeping (higher OIDP score) than those with less than 20 NT. Patients with a greater number of teeth may be subject to a greater amount of severe decay or periodontal disease, which can be painful, than patients with fewer teeth. This might account for the greater difficulty in sleeping reported by participants with at least 20 NT.

When we evaluated the effect of tooth loss on the total OIDP score from 32 teeth sequentially down to 0 teeth, we found no significant differences between the total OIDP scores of patients with 32–24 teeth. This might be because the most common cause of tooth loss was due to the extraction of four impacted third molars, four first pre-molars for orthodontic reasons, and two lower first molars (the first permanent teeth, which erupt into the oral cavity). The first significant difference was found between the total OIDP score of participants with at least 23 teeth and that of participants with less than 23 teeth. This indicates that maintaining at least 23 teeth is important in Thai elderly dental patients in this study group perceiving they have a good quality of life. We found that there were significant differences between the total OIDP scores of those with 23–5 teeth. This suggests that every tooth lost from 23 to 5 teeth progressively impacts patients' daily activities such as eating, speaking, and interacting with other people. The last significant difference was found between the total OIDP score of participants with at least 5 teeth and that of participants with less than 5 teeth. This suggests that when dental disease progresses and natural teeth need to be extracted, the observations from our

study sample may suggest that clinicians should strive for Thai elderly dental patients to maintain at least 5 NT, if possible, to have a better quality of life. Finally, we found no significant differences between the total OIDP scores from 4 to 0 remaining teeth. This might be because the participants in this study thought that 0–4 remaining teeth had the same effects in their daily performances.

When considered the relationship between the number of POP and OHRQoL based on the goal of the Thai Ministry of Public Health, we found that the participants with at least 4 POP had a significantly higher OHRQoL than those with less than 4 POP, in case of overall dimension (total OIDP), physical dimension (eating, speaking, and cleaning teeth), and social dimension (smiling and enjoying interaction with people). These are similar to the results of previous studies of Tsakos *et al.*[33].

Our findings showed that the OHRQoL of the participants with removable dentures was not statistically different from that of the participants without removable dentures. Moreover, the results revealed that the participants without denture problems had a significantly higher OHRQoL than those with denture problems, in case of overall dimension (total OIDP), physical dimension (eating and speaking), and psychological dimension (maintaining usual emotional state without being irritable). These findings are similar to the results of previous studies[28,33,34].

Based on our results, we suggested people attempt to maintain as many of their NT as possible to have good quality of life. They should have routine dental examinations to evaluate their oral health and should maintain good oral hygiene. In the event of tooth loss, they should seek dental care to get proper treatment for their conditions, such as dentures.

We must stress that the present study is preliminary in nature. The results of this study were from Thai elderly dental patients in Graduated Prosthodontic Clinic at the Faculty of Dentistry, Chulalongkorn University, who sought for dental treatment and thus had different characteristics from the general Thai elderly population. However, this study shows the effects of the number of NT and the number of POP (based on the goal of the Thai Ministry of Public Health) on the OHRQoL. Our study suggests further investigations to assess the effects of the number of NT and of POP on the OHRQoL of the general elderly population in Thailand, and to determine whether there is significant improvement in OHRQoL after regaining the proper number of teeth and POP after prosthodontic treatment. Furthermore, we can modify the classification of the remaining teeth obtained from this study and apply as a part of charting form of dental hospitals in academic hospitals and/or general hospitals which served a lot of patients to predict the characteristics and the treatment expectations of the elderly dental patients.

Conclusions

We concluded that Thai elderly dental patients in the Graduate Prosthodontic Clinic at the Faculty of Dentistry, Chulalongkorn University with at least 20 NT or at least 4 POP had greater OHRQoL than those with less than 20 NT or less than 4 POP. Furthermore, it could be concluded that Thai elderly dental patients in this clinic should have at least 23 NT to perceive having a good quality of life. Thus, maintaining or restoring at least 23 teeth can be considered as a critical threshold for treatment planning. We found that, in our study sample, there was no difference in perceived quality of life when less than 5 teeth remained. This indicates that maintaining at least 5 teeth may be an important clinical threshold for these Thai elderly dental patients.

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