Physical Pain in Oral Health Impact Profile among Korean Adults(55+): Distribution and Associated Factors

Kwang-Hak Bae[1], Hyun-Duck Kim[1], Se-Hwan Jung[2], Deok-Young Park[2], Dai-Il Paik[1], Sung-Chang Chung[3]

[1]Department of Preventive and Public Health Dentistry, College of Dentistry, Seoul National University,
[2]Department of Preventive and Public Health Dentistry, College of Dentistry, Kangnung National University,
[3]Department of Oral Medicine and Oral Diagnosis, Seoul National University

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1. Introduction

No evidence about Oral Health related Quality of Life (OHRQOL) has been reported in Korea, while various results of studies on geriatric oral health have been reported in other countries[1-3].

In Korea, aged population is increasing rapidly and the proportion of senior persons aged over 65 passed over 7% of the entire population in 2000, and it is expected to reach 14% by 2020[4]. Because of demographic changes, social problems related to elders such as their economic poverty, poor systemic and/or oral health, and psychological pains such as sense of being alienated and falling behind are emerging. For improving elders' oral health, the geriatric oral health has been developed[5]. Pain related to oral health has been perceived as an important factor in assessing elders' oral health.

Physical Pain in Oral Health Impact Profile (OHIP) was selected as the first step on the OHRQOL among Korean elders, because OHIP has been used for evaluating OHRQOL in US and European countries. In particular, OHIP which has

Table 1. Distribution of subjects by sex, age group, denture status and residential area

	total(n=1098) number(%)	male(n=459) number(%)	female(n=639) number(%)	p-value*
Age group(years)				.046
55-64	443(40.3)	205(44.7)	238(37.2)	
65-74	482(43.9)	188(41.0)	294(46.0)	
≥75	173(15.8)	66(14.3)	107(16.8)	
Denture status				.017
Dentate	651(59.4)	292(63.6)	359(56.2)	
Removable	232(21.2)	95(20.7)	137(21.4)	
Complete	213(19.4)	72(15.7)	141(23.4)	
Area				0.196
Urban	482(43.9)	191(41.6)	291(45.5)	
Rural	616(56.1)	268(58.4)	348(54.5)	

*P-value determined from chi-square statistic

been frequently utilized to identify the effects of elders' life quality on their oral health, includes a group of questions related to pain along with other groups of questions[6]. Notwithstanding that Physical pain as a component of OHIP consists of nine question items with reliability and validity, Physical pain in OHIP has been a new tool to investigate the subjective reports about oro-facial pain symptoms so far.

The objectives of this study were 1) to evaluate the prevalence of Physical pain in OHIP and 2) to determine factors associated with Physical pain in OHIP

2. Methods

A cross-sectional study was surveyed using telephone interview to meet the objectives of this study.

2.1. Subjects

Estimated sample of 4,250 Korean elders were selected stratified randomly as the sample cohort

of Korean national survey of oral health in the year of 2000. Of them, 1,098 subjects agreed to accept telephone interview. Age ranged from 56 to 87 years, with a mean of 67.1 years (SE=0.20). The subjects consisted of 459 men and 659 women. Table 1 shows the differences of the distribution between male and female by age group, denture status and residential area.

2.2. Data collection

Data were obtained by telephone interview from January to February in the year 2002. For the survey, 10 telephone interviewers were selected and trained about the guideline of the questions for this survey for reducing bias among the interviewers. The guideline consisted of instructions about questions and cautions on interview that had been obtained from a preliminary survey. Questionnaires and information about this survey were sent by ordinary mail to 4,250 estimated subjects, and the interviewers tried to do the telephone interview for them in two weeks from mailing. Of them, only

Table 2. Test-retest reliability of Physical pain questions in Oral Health Impact Profile (n=155)

Question*	Kappa(5 x 5)	Stability (intra-class correlation coefficient)
Painful Aching in mouth: Have you had painful aching in your mouth?	0.14	0.34
Sore Jaw: Have you had sore jaw?	0.24	0.23
Headache due to oral problems: Have you had headaches because of problems with your teeth, mouth or dentures?	0.12	0.35
Sensitive Teeth: Have you had sensitive teeth, for example, due to hot or cold foods or drinks?	0.21	0.42
Toothache: Have you had toothache?	0.13	0.33
Painful Gum: Have you had painful gums?	0.22	0.45
Uncomfortable to Eat: Have you found it uncomfortable to eat any foods because of problems with your teeth, mouth or dentures?	0.15	0.49
Sore Spot: Have you had sore spots in your mouth?	0.10	0.25
Uncomfortable Denture: Have you had uncomfortable dentures?	0.25	0.28

* Question about pain during the past 12 months

1,098 (26%) subjects willingly gave the useful information.

Physical pain questions in OHIP (Table 2) consisted of nine items such as "Painful Aching of mouth", "Sore Jaw", "Headache due to problems in mouth", "Sensitive Teeth", "Toothache", "Painful Gum", "Uncomfortable to Eat", "Sore Spot" and "Uncomfortable Denture". Four questions about respondents' sex, age, area of residence and their denture status were included in the questionnaires for evaluating the difference of the prevalence of physical pain between groups. The interview questionnaires consisted of 13 question items altogether. Responses to the question about how frequently they had experienced each problem during the past 12 months were the degree based on a five-point Likert scale: 'never' (code:0), 'hardly ever' (code:1), 'occasionally' (code:2), 'fairly often' (code:3), and 'very often' (code:4).

For evaluating stability reliability, a repeated

administration of each nine items of Physical Pains was applied to the 155 sub-samples of the same cohort three months later from the first interview.

2.3. Analyses

The internal consistency reliability of the nine-item pain questionnaire was assessed using Cronbach's reliability coefficient alpha. Stability reliability was assessed using intraclass correlation coefficient (ICC) and five by five Kappa index based on a repeated test.

For evaluating prevalence of nine Physical pains, the data were dichotomized. Those who answered 'fairly often' or ' very often' were classified into 'the pain experienced', while those who answered 'never', 'hardly ever' or 'occasionally' were classified into 'the pain-unexperienced'. The difference of the proportion of the pain-experienced was compared by sex, age, denture status and area, and tested by chi-square statistic. Age was classified into three categories, 55-64, 65-

Table 3. Prevalence of Physical pain in Oral Health Impact Profile by sex and age group

Type of Physical pain	Total (n=1098)	Sex			Age group			
		male (n=459)	female (n=639)	p-value*	55-64 (n=443)	65-74 (n=482)	≥75 (n=173)	p-value*
Painful Aching of mouth	10.8	8.9	12.1	0.098	10.8	10.2	12.1	0.775
Sore Jaw	4.6	4.4	4.9	0.697	3.6	5.0	6.4	0.314
Headache	6.8	3.9	8.8	0.001	5.9	6.5	9.8	0.205
Sensitive Teeth	26.0	23.7	27.7	0.141	30.0	25.9	16.2	0.002
Toothache	16.1	16.4	15.8	0.800	17.8	14.3	16.2	0.352
Painful Gum	17.2	14.2	19.4	0.025	6.1	7.3	3.8	0.024
Uncomfotable to Eat	24.8	10.2	14.6	0.809	22.1	24.9	31.2	0.063
Sore Spot	12.9	11.3	14.1	0.180	11.7	13.1	15.6	0.434
Uncomfotable Denture	16.9	18.1	16.1	0.448	12.4	17.4	25.2	0.004

*P-value determined from chi-square statistic

Table 4. Prevalence of Physical pain in Oral Health Impact Profile by area and denture status

Type of Physical pain	Total (n=1098)	Area			Denture status			
		urban (n=482)	rural (n=616)	p-value*	dentate (n=651)	removable (n=232)	complete (n=213)	p-value*
Painful Aching of mouth	10.8	10.0	11.4	0.463	9.8	11.6	12.7	0.458
Sore Jaw	4.6	1.9	2.7	0.694	3.7	6.9	5.2	0.128
Headache	6.8	7.1	6.5	0.709	5.6	9.1	8.0	0.137
Sensitive Teeth	26.0	26.8	25.5	0.632	18.6	4.9	2.4	0.001
Toothache	16.1	6.7	9.3	0.581	10.3	4.0	1.7	0.006
Painful Gum	17.2	6.7	10.6	0.109	13.8	22.9	21.6	0.001
Uncomfotable to Eat	24.8	9.7	15.1	0.059	22.7	28.9	26.3	0.148
Sore Spot	12.9	5.3	7.7	0.432	7.1	3.4	2.5	0.300
Uncomfotable Denture	16.9	16.2	17.4	0.660	0.0	31.0	28.6	0.605§

*P-value determined from chi-square statistic
§ Chi-square statistic between removable denture wearer and complete denture wearer

74 and 75 or over year subgroups, and area was dichotomized as urban and rural. Denture status was classified into three categories, "dentate" who was not wearing any type of removable or complete denture, "removable" who was wearing any type of removable denture in maxilla and/or mandible, "complete" who was wearing any type of complete denture in maxilla and/or mandible. Hence, removable or complete denture wearer had the possibility to keep some teeth. Those who were wearing both removable and complete dentures were classified into complete denture wearer. For the association of sex, age, denture status and area with the prevalence of Physical pain in OHIP, Odds Ratios (OR) of predictor variables on Physical Pain were evaluated. Logistic regression analysis was applied for adjusted OR. Interaction terms were also assessed. In multivariate logistic regression model on "uncomfortable denture", denture status was dichotomized into removable denture and complete denture by excluding dentate. The overall Physical Pain Score (PPS) was obtained from the summation of codes of nine items in

relation to pains. For getting PPS, the codes were not weighted. PPS was evaluated between groups and tested by t-test and one-way ANOVA including Scheffe's test.

For the association of sex, age, denture status and area with PPS, multivariate linear regression analyses were applied and the interaction terms were also evaluated. Denture status was dichotomized as dentate and denture (removable plus complete) for multivariate linear regression model.

The level of statistical significance was set at 0.05 of type I error.

3. Results

The internal consistency reliability of the nine-item pain questionnaire was Cronbach's alpha coefficient of 0.85, indicating good reliability. Stability in the pattern of response on PPS assessed in a test-retest of 155 subjects was intraclass correlation coefficient of 0.50. The test-retest reliability of each nine questions assessed among 155 subjects ranged from 0.23 to 0.49 of intraclass correlation coefficient and from 0.10 to 0.25 of Kappa index (Table 2).

Tables 3 and 4 give the results of the bivariate analyses for the dichotomous and categorical variables. The prevalence of Physical Pains in OHIP widely fluctuated ranging from 4.6% for Sore Jaw to 26.0% for Sensitive Teeth among total subjects. The prevalence of Headache due to oral problems was higher by 4.9% in women than in men (p=0.001). The prevalence of Painful Gum was also higher by 5.2% in women than in men

(p=0.025). The prevalence of Sensitive Teeth decreased from 30.0% to 16.2%, as the age increased (p=0.002). The prevalence of Painful Gum decreased also from 7.3% to 3.8% with an increment of the age (p=0.024), while the prevalence of Uncomfortable Denture increased with an increment of the age (p=0.004). The prevalence of Uncomfortable to Eat was higher by 5.4% in rural group than in urban group, but it was not statistically significant (p=0.059). Among denture status groups, the prevalence of Sensitive Teeth was higher by 14% in dentate group than in denture group (p < 0.001), and that of Toothache was also higher by 6% in dentate group than in denture group (p=0.006), while that of Painful Gum was higher by 8% in denture group than in dentate group (p=0.001).

In terms of ORs, Painful Aching of Mouth, Sore Jaw, Uncomfortable to eat, Sore Spot and Uncomfortable Denture did not show ORs that was statistically significant. According to the results of bivariate analyses, there was significant difference of the prevalence of Painful Gum and Uncomfortable Denture among age groups. After controlling for sex, denture status and area, the difference was not statistically significant. Table 5 shows some significant ORs adjusted for sex, age group, denture status and residential area. In Headache, The odd of prevalence was 2.30 (95% Confidence Interval=1.33,3.99) times higher for female than for male. In Sensitive Teeth, the odds of prevalence was 1.34 (95% CI=1.01,1.78) times higher for female than for male, and 0.68 (95% CI=0.48,0.96) times less for removable denture wearers and 0.33 (95% CI=0.21,0.51) times less for

Table 5. Crude and adjusted OR relaing sex, age, denture status and residential area to physical pain symptoms from multiple logistic regression model

Symptom	Explanatory variable	Crude OR (95% CI)	Adjusted OR (95% CI)	p-value*
Headache[§] (n=1090)	Sex(male=0, female=1)	2.38(1.39,4.10)	2.30(1.33,3.99)	0.003
	Denture status			
	Dentate	Referent	Referent	
	Removable	1.70(0.97,2.97)	1.62(0.92,2.85)	0.096
	Complete	1.48(0.81,2.69)	1.25(0.67,2.34)	0.479
	Age(55-64=0, 65-74=1, ≥75=2)	1.30(0.94,1.80)	1.23(0.87,1.73)	0.236
	Area(urban=0, rural=1)	0.91(0.57,1.47)	0.90(0.56,1.45)	0.654
Sensitive Teeth[‖] (n=1096)	Sex(male=0, female=1)	1.23(0.93,1.62)	1.34(1.01,1.78)	0.042
	Denture status			
	Dentate	Referent	Referent	
	Removable	0.67(0.47,0.94)	0.68(0.48,0.96)	0.030
	Complete	0.31(0.20,0.48)	0.33(0.21,0.51)	0.001
	Age(55-64=0, 65-74=1, ≥75=2)	0.71(0.59,0.87)	0.79(0.64,0.97)	0.023
	Area(urban=0, rural=1)	0.94(0.71,1.23)	1.04(0.79,1.38)	0.774
Toothache[¶] (n=1095)	Sex(male=0, female=1)	0.96(0.69,1.33)	1.01(0.73,1.40)	0.955
	Denture status			
	Dentate	Referent	Referent	
	Removable	1.11(0.76,1.64)	1.11(0.75,1.64)	0.591
	Complete	0.47(0.28,0.78)	0.47(0.28,0.80)	0.005
	Age(55-64=0, 65-74=1, ≥75=2)	0.90(0.72,1.13)	0.98(0.77,1.24)	0.834
	Area(urban=0, rural=1)	1.10(0.79,1.52)	1.13(0.81,1.57)	0.480
Painful Gum[†] (n=1094)	Sex(male=0, female=1)	1.45(1.05,2.02)	1.41(1.01,1.97)	0.041
	Denture status			
	Dentate	Referent	Referent	
	Removable	1.85(1.27,2.71)	1.76(1.20,2.58)	0.004
	Complete	1.71(1.16,2.54)	1.49(0.99,2.25)	0.059
	Age(55-64=0, 65-74=1, ≥75=2)	1.31(1.05,1.62)	1.20(0.96,1.51)	0.112
	Area(urban=0, rural=1)	1.30(0.94,1.79)	1.25(0.90,1.73)	0.181

*P-value determined from Wald chi square statistic
[§] Model's adjusted R-square=0.01
[‖] Model's adjusted R-square=0.04
[¶] Model's ajusted R square=0.01
[†] Model's ajusted R square=0.02

complete denture wearers than for dentate persons. In Toothache, the odd of prevalence was higher for dentate persons than for complete denture wearers: the adjusted OR of 0.47 (95% CI=0.28,0.80) for complete denture wearer remained unchanged from the crude OR of 0.47 (95% CI=0.28,0.78). In Painful Gum, the odds of prevalence was 1.41 (95% CI=1.01,1.97) times higher for female than for male and 1.76 (95% CI=1.20,2.58) times higher for Removable denture

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Table 6. Physical Pain Score in Oral Health Impact Profile by sex,
age, denture status and residential area.

Variable(n=1098)	N	Mean	St. dev.	p-value
Sex				
male	459	10.29	7.30	0.881*
female	639	10.22	7.54	
Age group(yrs)				
55-64	443	10.09	7.28	
65-74	482	10.29	7.49	0.767†
≥75	173	10.57	7.68	
Denture status				
dentate	651	9.61	7.29	0.001*
denture	445	11.21	7.56	
Area				
urban	482	9.82	7.25	0.085*
rural	616	10.59	7.56	

* P-value determined from t-test
† P-value determined from one-way ANOVA

Table 7. Relation between sex, age, residential area and denture status with Physical Pain Score in Oral Health
Impact Profile from multivariate linear regression*

Variable	Coefficient	Standard error of coefficient	Standardized coefficient	p-value†
Sex(male=0, female=1)	-0.145	0.456	-0.010	0.750
Denture status(dentate=0, denture=1)	1.576	0.468	0.104	0.001
Age(55-64=0, 65-74=1, ≥75=2)	-0.039	0.325	-0.004	0.906
Area(urban=0, rural=1)	0.664	0.453	0.044	0.143

* N=1096, Model's R-square=0.01
† P-value determined from multiple linear regression

wearers than for dentate persons.

Table 6 gives the difference in PPS between groups. PPS was higher by 1.60 for denture wearers than for dentate persons (p < 0.001). PPS was higher by 0.77 for rural persons than for urban, but the difference was not statistically significant (p=0.085). Table 7 shows that Denture Status was associated with higher PPS after controlling for sex, age and area. Only wearing any type of denture increased PPS by 1.6 (regression coefficient=1.576; p=0.001).

4. Discussion

Pain is a major public health problem, with evidence indicating that the lifetime prevalence of pain enough to use health care resources may be over 80%[7]. In the classifications of pain, pain relating to the face and mouth is orofacial pain(OFP)[8]. OFP includes 7 type of pains such as Jaw joint pain, Face fain, Toothache pain, Temperature sensitivity, Pain when chewing, Painful oral sore and Burning mouth[9]. Out of seven pains of OFP, Physical pain in OHIP includes five pains except Face pain and Burning

mouth. Additionally, it adds Painful Aching, Headache due to oral problems, Painful Gum and Uncomfortable Denture. Physical pain in OHIP consists of nine pains. Therefore, Physical pain can be useful to investigate the subjective report of OFP symptoms.

Since this study was the first trial among Korean elders, we tried to accept basic idea about Physical pain in OHIP from gathering data to analyses as suggested by Slade and Spencer[6]. Though that of telephone interview has a problem of lower reliability, we selected telephone interview to reduce the number of missing items as suggested. The internal reliability of the nine-item pain questionnaire was 0.85 of Cronbach's alpha coefficient in this study, which was higher than 0.76 of Slade's study[6]. In terms of the overall reliability of PPS, ICC was 0.50 that was a bit higher than that of Slade's study (ICC=0.42)[6]. Since the subjects were selected randomly without any consideration of socio-economic status, some types of questionnaires with low reliability could be also suitable to evaluate a case of the subjective report of OFP symptoms among Korean elders. For evaluating prevalence, data were dichotomized as suggested in Slade's study[6]. For getting PPS, data were not weighted, because the weight was not developed for Korean elders. Further study will be needed to develop the modification of OHIP for the Korean, which guarantees relatively high reliability and validity.

The results of this study showed that women was more likely than men to report "Headache due to oral problems", "Sensitive Teeth" and "Painful Gum". These results provided further evidence that women are more likely than men to report pain. The results were supported by previous studies[10-13]. The consistent finding of a higher prevalence in women may be due to a higher biological sensitivity to stimuli; women may detect signals that men might not notice, and at a cognitive level, the threshold for labeling stimuli as painful might be lower for women than men[11].

The greater risk of symptoms was among younger people and the lowest prevalence was among individuals aged more than 60 years[12], and a bell-shaped age distribution was observed in the prevalence of OFP[13]. With aging, the prevalence of Sensitive Teeth was declined. The difference among age groups may be resulted from teeth loss accompanying aging. According to Oral Health Status of Koreans (2000)[14], it was reported that average number of existing permanent teeth decreased with age. The results of this study showed that age was not associated with overall PPS and any type of individual pain among nine physical pain items. The results strongly support that age of 60 years or more may not influence the prevalence of physical pain in elderly persons[15,16].

Of the results of this study, Removable denture wearers were more likely than dentate persons to report Painful Gum, and that complete denture wearers might be more likely than dentate persons to report Painful Gum. The results are in consistent with the results of previous studies[17,18]. The prevalence of Sensitive Teeth was higher in dentate persons than in removable and complete denture wearers, and the prevalence of Toothache was higher in dentate persons than in complete denture wearers. It may be the reason why dentate

persons have more natural teeth than denture wearers.

According to the results of PPS evaluation, only Denture status was associated with higher PPS after controlling for sex, age and area. For better Quality Of Life, it is indispensable to reduce denture wearer: keeping people dentate will give better life. This result reminds us the importance of prevention of oral disease. Though sex was associated with some of Physical Pains, sex was not associated with overall PPS. This result suggests that Sex may not be an influencing factor on the OFP. The difference between male and female may be fluctuated by the type of pain. PPS might be higher in rural persons than in urban persons ($p=0.085$). This result gives the possibility that socioeconomic life-style factors might be influencing factors on the prevalence of Physical pain in OHIP. This study has been limited to only Physical pain, though reports on pains are determined by extremely complicated and diverse factors such as physical, psychological and social factors.

Reports on pains are determined by extremely complicated and diverse factors such as physical, psychological and social factors[19]. Reports about pain occurring in elders who are in such a unique physical and psychological situation are expected to reveal the characteristics of the pain different from those in younger people. Compared to younger people, many factors should be considered in managing elders' oral health, because of their physical and psychological characteristics accompanying their aging. For getting more critical associations of factors on OFP,

other factors such as socioeconomic, psychological and dental behaviors should be included in the analyses. It remains for the further study.

5. Conclusions

The prevalence of Sensitive Teeth decreased with age. Removable denture wearers were more likely to report Painful Gum than dentate persons. Gender was associated with the prevalence of Headache, Sensitive Teeth and Painful Gum: women showed more odds of prevalence. Only denture status was associated positively with overall PPS, while gender and age were not associated with overall PPS.

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국문초록

55세이상성인 대상 구강보건영향지수의
물리적동통에 관한 연구

배광학[1], 김현덕[1], 정세환[2], 박덕영[2], 백대일[1], 정성창[3]

[1]서울대학교 치과대학 예방치학교실, [2]강릉대학교 치과대학 예방치학교실
[3]서울대학교 치과대학 구강내과진단학교실

색인 : 물리적동통, 구강보건영향지수, 55세이상성인, 유병률, 연관

　　본 연구의 목적은 첫째, 55세이상성인을 대상으로 구강보건영향지수 중 물리적동통의 유병률을 파악하고, 둘째, 55세이상성인의 구강건강충격지수 중 물리적동통의 연관요인을 파악함에 있다. 조사대상자는 2000년 국민구강건강조사시 충화무작위추출법으로 표본추출된 4,250명의 55세이상성인집단 중에서 본 연구의 목적에 동의한 1,098명의 55세이상성인이었고, 조사방법은 전화면접조사법이었다. 면접문항은 구강건강충격지수 중 물리적동통에 관련된 9개의 문항과 성, 연령, 거주지역 및 의치장착여부등에 관한 4문항을 합하여 총 13문항이었고, 동통정도의 응답은 5점리커트척도(0-4)를 이용하여 기록되었다. 동통유병률은 동통정도 0-1을 동통무경험자로, 동통정도 2-4를 동통유경험자로 하였고, 총물리적동통정도(PPS)는 9개의 개별물리적동통정도의 합으로 최저 0점에서 최고 36점에 분포하도록 하였다. 동통유병률에 관한 연관요인을 파악하기 위하여 다변량 로지스틱회귀분석을 실시하였고, 총물리적동통정도에 관한 연관요인을 파악하기 위하여, 다변량 선형회귀분석을 실시하였다. 두통, 치은동통, 과민성치아 등에 관한 유병률은 각각 6.8%, 17.2% 및 26.0% 이었다. 여자는 남자에서 보다 두통유병률의 가능성이 2.3배(95% 신뢰구간=1.33,3.99) 높았고, 치은동통유병률의 가능성은 1.4배(95% 신뢰구간=1.01, 1.97) 높았다. 국부의치장착자는 의치비장착자보다 치은동통유병률의 가능성이 1.8배(95% 신뢰구간=1.20, 2.58) 높았으며, 의치장착은 총물리적동통정도를 1.58 증가시켰다 (확률값=0.001). 총괄적으로, 두통유병률과 과민성치아유병률의 연관요인은 성이었고, 치은동통유병률의 연관요인은 성과 의치장착이었다.