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치의학석사 학위논문

Association between dry mouth  
and Oral Health Related Quality  
of Life among rural Korean  
adults

한국 농촌 지역 노인들에서 구강 건조증이  
구강건강 관련 삶의 질에 미치는 영향

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치의학과

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and Oral Health Related Quality  
of Life among rural Korean  
adults

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## Abstract

# Association between dry mouth and Oral Health Related Quality of Life among rural Korean adults

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**Objective:** The dry mouth has been known as symptom making uncomfortable people especially adults. Recent research suggested that the dry mouth affects the day-to-day lives of older people, but there were few studies that are dealt with participants including both adults and elders and evidence with adjusted association controlling for medical factors. This study aimed to evaluate the association between dry mouth and oral-health-related quality of life among Korean adults including elders controlling for potential confounders encompassing medical factors.

**Study Design:** A cross-sectional study of longevity cohort in Sunchang (Korea) with 489 participants (aged 49-93) was performed. Dry mouth was measured with a single question and VAS and oral health related quality of life was evaluated using short form Korean version of Oral Health Impact Profile-14 (OHIP-14K). All the information about the main analysis and confounders were collected by interviews. Chi-square test and Spearman correlation were used for evaluating association between the dry mouth and OHIP-14K scores. Poisson

regression analyses including confounders were applied to evaluate the adjusted association between dry mouth and OHIP-14K.

**Results:** Mean value (11.03; sd, 10.24) and prevalence (84.2%) of total OHIP-14K scores with dry mouth had higher than mean value (6.87; sd, 8.17) and prevalence (72.2%) of those without dry, with statistically significant at the  $p$ -value  $< 0.01$ . Total OHIP-14K score ( $R=0.28$ ,  $p<0.01$ ) and six OHIP-14K subscale scores except social disability had a relationship with the dry mouth by spearman correlation. In multivariate Poisson regression analyses, our data showed dry mouth was found to be associated with prevalence of total (adjusted prevalence ratio (PR) of 1.16), functional limitation (adjusted PR of 1.49), physical pain (adjusted PR of 1.32), psychological discomfort (adjusted PR of 1.36), physical disability (adjusted PR of 1.49) and psychological disability (adjusted PR of 1.62) subscales OHIP-14K after controlling for confounders. The links was highlighted in elders aged 71-93 years, females, those with low economic-level, non-smokers, non-drinkers, those without diabetes, non-hypertensives, non-obese adults, those with non-medication, and denture-wearers.

**Conclusions:** Our data showed that dry mouth was independently associated with OHIP-14K among the adults. Thus, dry mouth is substantial health problem that affects oral health related quality of life.

**Keywords:** Dry mouth, Oral-health-related quality of life, Oral Health Impact Profile-14K (OHIP-14K), Stratified subgroup analysis, adjusted prevalence ratio

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# I. Introduction

In many countries, the proportion of elderly people is increasing steadily in recent years. Also, South Korea is fast becoming an aged society, in which more than 14 percent of the population is 65 or older. Dry mouth is a frequent symptom in the elderly population. The prevalence has been estimated to range from 12% to 39% in U.S.A. (Thomson et al., 1999). Among the Korean elders, 70.1% reported to have at least one dry mouth-related symptom and 25.8% were classified with considerable dry mouth (So et al., 2010). Dry mouth is defined as the subjective feeling of dryness in the mouth, which is not always associated with salivary flow rate (Field et al., 2003). Dry mouth has been reported to affect important aspects of life such as speaking, taste sensing, food ingesting, and the dental prosthesis using, which affects physical, functional, social, and psychological health including causing gingival ulcer (Cassolato and Turnbull, 2003; Ikebe et al., 2005). This is strongly suggesting that the influence of dry mouth includes not only the oral cavity but also day-to-day lives of people (Thomson et al., 2006).

The influence of dry mouth could be evaluated by the Oral Health Impact Profile-14 (OHIP-14) which is preferred measurement for oral health related quality of life (Bae et al., 2007; Slade and Spencer, 1994; Slade, 1997). As the importance of oral health is highlighted for the quality of life, the patient-based outcome methods are developed. The Oral Health Impact Profile (OHIP) (Slade and Spencer, 1994) is a well-organized measurement of oral-health-related quality of life (OHRQoL). Oral Health Impact Profile-14 (OHIP-14) (Slade, 1997) is the short form of an earlier 49-item method. Korean version short form of the Oral Health Impact Profile (OHIP-14K) (Bae et al., 2007) (Reliability (Cronbach's alpha: 0.93, ICC: 0.63) Validity (Pearson's correlation coefficients

R<sup>2</sup>-value: 0.96)) The OHIP-14 is including Functional limitation, Physical pain, Psychological discomfort, Physical disability, Psychological disability, Social disability, and Handicap subscales.

The studies of dry mouth are usually dealt with older participants, and they have suggested that dry mouth has an association with OHIP in Canada (Locker, 2003). There is a study not for the elderly but for only young adults in their early thirties having dry mouth in New Zealand (Thomson et al., 2006). There was also an association between dry mouth and oral-health-related quality of life. Also, there were previous studies investigated the relationships dry mouth and Oral Health Impact Profile (OHIP) for the older participants in Korea. The OHIP score was affected by dry mouth. However, medical conditions were not considered for analyses (Lee, 2006), and analyses for adjusted association were not done (Park, 2010).

Up to now, there was few study that includes adult participants of every age (not just elderly) and medically compromised factors (such as diabetes, hypertension, obesity defined by BMI), and investigated the adjusted association and subgroup analysis between dry mouth and subscales of OHIP-14 (Figure 1).

This study was conducted in a Korean country Sunchang. Participants of the study are aged from 49 to 93 years, not just the elderly. In the study, for evaluating oral-health-related quality of life, OHIP-14 were used in two ways: first, a total OHIP-14 score was calculated by summing responses over all 14 items; second, OHIP-14 subscale scores were calculated for each of the dimensions indicated in Table 1 divided by 7 categories.

The goals of this study was to evaluate the association between dry mouth and oral-health related quality of life using the Oral Health Impact Profile-14K (OHIP-14K) on Korean

adults (ages ranged from 49 to 93) by exploring adjusted association and doing subgroup analyses with the considering factors; age, gender, economic level, present smoking, drinking, diabetes, hypertension, obesity defined by BMI, smoking, alcohol drinking, medication, and wearing denture.

## **II. Materials & Methods**

### **1. Participants**

A sample of 489 rural-dwelling elders aged from 49 to 93 (173 males, 316 females, mean age: 70.9, SD=7.8) who participated to the Sunchang Elderly Cohort Study from January 2009 to February 2010 was selected. The participants are adults with or without dry mouth. They are out of the following two exclusion criteria: a single missing value in the health assessment or questionnaires; and a desire to quit participating. After the questionnaire for the interview, an informed consent including information about this study was obtained from each participant (Figure 2).

### **2. Data collection**

This was a cross-sectional study comprising baseline data from a large cohort study, the Sunchang Elderly Cohort Study. The study began recruiting participants from January 2009 to February 2010. Oral health and general health status were examined by many health professionals who participated in this survey. Information regarding sociodemo-graphic status and health-related behaviors was collected from the questionnaire through interviews. Also, general and oral health status and anthropometric measurements were obtained from clinical examinations.

For the participants, assessment of dry mouth was done by asking the question: "Do you feel discomfort due to dryness in

the mouth?” (Response options 'Yes' or 'No' ). To evaluate oral health-related quality of life, this study used Oral Health Impact Profile-14 (OHIP-14) (Slade, 1997). There are 14 items in OHIP-14. For each of the 14 items (Table 1), Participants were asked how often in the previous 4 weeks they had experienced the problem. Answers were coded as 'Never' (scoring 0), 'Hardly ever' (1), 'Occasionally' (2), 'Fairly often' (3) or 'Very often' (4). OHIP-14 scores were used in two ways: First, the OHIP-14K subscale score was calculated by summing up the scores of two items and its positive prevalence was indicated by any one item with score 3 or 4. Second, the total OHIP-14K score was calculated by summing up all score of OHIP-14K subscale and its positive prevalence was indicated by any positive subscale among 7 subscale prevalences. Item weights were not used. This calculation method is as same as that of the previous study in 2006 (Thomson et al., 2006).

### **3. Statistical Analyses**

Sociodemo-graphic status and general/oral health-related behaviors were selected as confounders. Age, sex, and monthly family income were selected as sociodemo-graphic factors. Health-related behaviors included diabetes, hypertension, diabetes, smoking, alcohol drinking, wearing denture, and medication.

For analyses, the differences in the prevalence of dry mouth were compared among the different groups of age (49–70 and 71 or over year), gender (Male and Female), economic-level (Low and High), present smoking (Yes and No), alcohol drinking (Yes or No), diabetes (Yes or No), hypertension (Yes or No), obesity (Yes or No), medication (Yes or No), and denture-wearing status (Yes or No) using chi-squared test.

Associations between dry mouth and mean and median overall and subscale OHIP–14 scores by dry mouth status were tested for statistical significance using the Mann–Whitney test.

Poisson regression analysis was used to evaluate the prevalence ratios of associations between prevalence and score of dry mouth and prevalence and score of OHIP–14K with or without controlling for confounders; Model I: age, gender, economic–level, Model II: all variables in model II plus smoking and alcohol drinking, Model III: all variables in model II plus diabetes, hypertension, obesity and medication, Model IV: all variables in model III plus wearing denture.

Stratified adjusted association between prevalence and score of dry mouth and prevalence and score of OHIP–14K were examined by multiple Poisson regression analyses and adjusted for the effect of confounders; all variables in Model IV (age, gender, economic level by monthly income, smoking, alcohol drinking, diabetes, hypertension, obesity defined by BMI, medication and wearing denture).

### **III. Results**

#### **1. Distribution of Confounders by Dry Mouth**

The prevalence of dry mouth was 44.2% in the present data by chi–square analysis (Table 2). The dry mouth group included 23.7% more female than health participants did. The dry mouth group reported 12.7% less prevalence of smoking, 11.6% more prevalence of taking medicine, 12.3% more prevalence of wearing denture than the people without dry mouth.

#### **2. Mean (Standard Deviation) value of**

## OHIP-14K scores and subscale scores by Dry Mouth

Total and subscales of OHIP-14 scores mean value with dry mouth had higher than those without dry mouth (Table 3), with all differences except Handicap subscale score ( $p$ -value = 0.11) on average being statistically significant at the  $p$ -value  $\leq 0.04$ . The mean value of total sum of OHIP-14K scores with dry mouth was 11.03 (sd, 10.24; range 0 to 56) and that without dry mouth was 6.87 (sd, 8.17; range 0 to 56). The mean value of functional limitation OHIP-14K subscale scores with dry mouth was 2.15 (sd, 2.54; range 0 to 8) and that without dry mouth was 1.16 (sd, 2.00; range 0 to 8). The mean value of physical pain OHIP-14K subscale scores with dry mouth was 2.50 (sd, 2.24; range 0 to 8) and that without dry mouth was 1.75 (sd, 1.92; range 0 to 8). The mean value of psychological discomfort OHIP-14K subscale scores with dry mouth was 1.98 (sd, 2.36; range 0 to 8) and that without dry mouth was 1.33 (sd, 2.11; range 0 to 8). The mean value of physical disability OHIP-14K subscale scores with dry mouth was 1.45 (sd, 1.92; range 0 to 8) and that without dry mouth was 0.73 (sd, 1.32; range 0 to 8). The mean value of psychological disability OHIP-14K subscale scores with dry mouth was 2.12 (sd, 1.54; range 0 to 8) and that without dry mouth was 0.88 (sd, 1.79; range 0 to 8). The mean value of social disability OHIP-14K subscale scores with dry mouth was 0.49 (sd, 1.07; range 0 to 8) and that without dry mouth was 0.29 (sd, 0.83; range 0 to 8). The mean value of handicap OHIP-14K subscale scores with dry mouth was 0.92 (sd, 1.28; range 0 to 8) and that without dry mouth was 1.32 (sd, 0.73; range 0 to 8). This result principally agrees with previous finding(Lee, 2006).

### **3. Association between the Dry Mouth and OHIP–14K scores**

Spearman correlation was used for evaluating association between the dry mouth and OHIP scores (Figure 3). Among each subscale of OHIP, functional limitation (FL) ( $R = 0.14$ ,  $p < 0.02$ ), physical pain (PP) ( $R = 0.27$ ,  $p < 0.01$ ), psychological discomfort (PSY\_DISCOM) ( $R = 0.14$ ,  $p < 0.02$ ), physical disability (P\_DISAB) ( $R = 0.24$ ,  $p < 0.01$ ) and psychological disability (PSY\_DISAB) ( $R = 0.29$ ,  $p < 0.01$ ), social disability (SOC\_DISAB) ( $R = 0.11$ ,  $p = 0.10$ ) and handicap (HANDI) ( $R = 0.16$ ,  $p < 0.01$ ) subscale OHIP scores were affected by the dry mouth. Also, total OHIP–14 score ( $R = 0.28$ ,  $p < 0.01$ ) had a relationship with the dry mouth.

### **4. Prevalence of OHIP–14K (very often or fairly often) by Dry Mouth**

Almost 84.2% of participants with dry mouth reported one or more impacts in OHIP scores occurring 'very often' or 'fairly often'. The crude prevalence ratio for total OHIP–14K is 1.17 ( $p$ -value  $< 0.01$ ). More obvious differences were observed with respect to prevalence of seven subscales OHIP–14K (all  $p$ -values  $< 0.05$ ) from Poisson regression analysis (Table 4).

### **5. Adjusted association between Dry Mouth and prevalence of total and subscale OHIP–14K**

In multivariate Poisson regression analyses, our data showed dry mouth was found to be associated with prevalence of total OHIP–14K after controlling for confounders (Table 5). The adjusted prevalence ratio (PR) were 1.16 (95% confidence

interval [CI]: 1.05–1.29) for Model I, 1.16 (95% confidence interval [CI]: 1.05–1.29) for Model II, 1.17 (95% confidence interval [CI]: 1.05–1.29) for Model III and 1.16 (95% confidence interval [CI]: 1.05–1.28) for Model IV. Also, prevalence of total OHIP–14K was associated with the diabetes (adjusted PR of 1.12) and wearing denture (adjusted PR of 1.10) (Model IV).

In multivariate Poisson regression analyses, dry mouth was found to be associated with prevalence of functional limitation (adjusted PR of 1.49 (95% confidence interval [CI]: 1.20–1.84)), physical pain (adjusted PR of 1.32 (95% confidence interval [CI]: 1.11–1.56)), psychological discomfort (adjusted PR of 1.36 (95% confidence interval [CI]: 1.11–1.67)), physical disability (adjusted PR of 1.49 (95% confidence interval [CI]: 1.16–1.92)) and psychological disability (adjusted PR of 1.62 (95% confidence interval [CI]: 1.26–2.10)) subscales OHIP–14K after controlling for confounders (Table 6). Also, most prevalence of subscales OHIP–14K except psychological discomfort subscale was associated with wearing denture (Model IV). Diabetes had a positive association with prevalence of physical pain subscale OHIP–14K score (adjusted PR of 1.23 (95% confidence interval [CI]: 1.03–1.48)), and economic–level also had a positive association with prevalence of psychological discomfort subscale OHIP–14K (adjusted PR of 1.25 (95% confidence interval [CI]: 1.04–1.49)).

## **6. Stratified adjusted association between Dry Mouth and prevalence of total and subscale OHIP–14K**

In handling the results from age–stratified analysis,

prevalence of total sum (adjusted PR of 1.22 (95% confidence interval [CI]: 1.03–1.44)), functional limitation (FL) (adjusted PR of 1.47 (95% confidence interval [CI]: 1.03–2.10)) and physical pain (PP) (adjusted PR of 1.45 (95% confidence interval [CI]: 1.10–1.93)) subscales OHIP–14K showed an association with dry mouth in aged 49–70 subgroup, and the association appeared in more than 70 years in functional limitation (FL) (adjusted PR of 1.50 (95% confidence interval [CI]: 1.15–1.95)), psychological discomfort (PSY\_DISCOM) (adjusted PR of 1.75 (95% confidence interval [CI]: 1.30–2.36)), physical disability (P\_DISAB) (adjusted PR of 1.51 (95% confidence interval [CI]: 1.03–1.44)), psychological disability (PSY\_DISAB) (adjusted PR of 1.86 (95% confidence interval [CI]: 1.31–2.64)) and social disability (SOC\_DISAB) (adjusted PR of 1.78 (95% confidence interval [CI]: 1.02–3.09)) subscales OHIP–14K. The prevalence ratios except total sum and physical pain (PP) subscale OHIP–14K were greater at 70 years than aged 49–70 subgroup (Table 7). In the subgroup analysis stratified according to gender, most of the OHIP subscales scores except social disability (SOC\_DISAB) (adjusted PR of 1.31 (95% confidence interval [CI]: 0.79–2.17)) showed an association in female subgroup, and the prevalence ratio in female subgroup was higher than that in male subgroup. When divided by economic–level in the subgroup, most prevalence of OHIP–14K except physical disability (P\_DISAB) and handicap (HANDI) subscales OHIP–14K showed an association with dry mouth in low level subgroup, and the prevalence ratios were greater at low level subgroup (adjusted PR of 1.37 (95% confidence interval [CI]: 0.99–1.88)) than high level subgroup (adjusted PR of 1.55 (95% confidence interval [CI]: 1.04–2.31)). The association appeared in high level subgroup in psychological disability (PSY\_DISAB) subscale OHIP–14K. In the subgroup analysis

stratified according to present smoking, most prevalence of total and subscales OHIP-14K except social disability (SOC\_DISAB) subscale (adjusted PR of 1.30 (95% confidence interval [CI]: 0.78-2.16)) showed an association with dry mouth in non-smoking subgroup, and the prevalence ratios were greater at non-smoking subgroup than smoking subgroup. In handling the results from drinking-stratified analysis, the prevalence of total sum (adjusted PR of 1.17 (95% confidence interval [CI]: 1.03-1.34)), functional limitation (FL) (adjusted PR of 1.60 (95% confidence interval [CI]: 1.20-2.14)), physical pain (PP) (adjusted PR of 1.37 (95% confidence interval [CI]: 1.10-1.70)), physical disability (P\_DISAB) (adjusted PR of 1.60 (95% confidence interval [CI]: 1.15-2.24)) and psychological disability (PSY\_DISAB) (adjusted PR of 1.57 (95% confidence interval [CI]: 1.14-2.16)) subscales OHIP-14K showed an association with dry mouth in non-drinking subgroup, and the prevalence ratios were greater at non-drinking subgroup than drinking subgroup. When divided by diabetes in the subgroup, most prevalence of total and subscales OHIP-14K except social disability (SOC\_DISAB) (adjusted PR of 1.41 (95% confidence interval [CI]: 0.90-2.22)) and handicap (HANDI) (adjusted PR of 1.30 (95% confidence interval [CI]: 0.98-1.72)) subscales OHIP-14K showed an association with dry mouth in non-diabetes subgroup, and the prevalence ratios were greater at non-diabetes subgroup than diabetes subgroup. In handling the results from hypertension-stratified analysis, most prevalence of total and subscales OHIP-14K except social disability (SOC\_DISAB) subscale OHIP-14K (adjusted PR of 1.38 (95% confidence interval [CI]: 0.86-2.22)) showed an association with dry mouth in non-hypertensive subgroup, and the prevalence ratios were greater at non-hypertensive subgroup than hypertensive subgroup. According to the results of

stratified analysis by obesity, most prevalence of total and subscales OHIP-14K except social disability (SOC\_DISAB) (adjusted PR of 1.69 (95% confidence interval [CI]: 0.97–2.95)) and handicap (HANDI) (adjusted PR of 1.15 (95% confidence interval [CI]: 0.85–1.57)) subscales OHIP-14K showed an association with dry mouth in non-obese subgroup, and prevalence of functional limitation (FL) (adjusted PR of 1.61 (95% confidence interval [CI]: 1.12–2.33)), physical disability (P\_DISAB) (adjusted PR of 1.62 (95% confidence interval [CI]: 1.08–2.43)), and psychological disability (PSY\_DISAB) (adjusted PR of 1.48 (95% confidence interval [CI]: 1.00–2.18)) subscales OHIP-14K showed an association with dry mouth in non-obese subgroup. The prevalence ratios of functional limitation (FL) (adjusted PR of 1.15 (95% confidence interval [CI]: 0.85–1.57)), physical disability (P\_DISAB) (adjusted PR of 1.15 (95% confidence interval [CI]: 0.85–1.57)) subscale OHIP-14K were greater at obese than non-obese subgroups. In the subgroup analysis stratified according to medication, prevalence of total sum (adjusted PR of 1.23 (95% confidence interval [CI]: 1.02–1.48)), functional limitation (FL) (adjusted PR of 1.64 (95% confidence interval [CI]: 1.11–2.42)), physical disability (P\_DISAB) (adjusted PR of 1.83 (95% confidence interval [CI]: 1.14–2.94)), psychological disability (PSY\_DISAB) (adjusted PR of 1.53 (95% confidence interval [CI]: 1.00–2.33)) subscales OHIP-14K showed an association with dry mouth in non-medication subgroup, and prevalence of functional limitation (FL) (adjusted PR of 1.41 (95% confidence interval [CI]: 1.09–1.82)), physical pain (PP) (adjusted PR of 1.33 (95% confidence interval [CI]: 1.08–1.64)), psychological discomfort (PSY\_DISCOM) (adjusted PR of 1.30 (95% confidence interval [CI]: 1.02–1.65)), and psychological disability (PSY\_DISAB) (adjusted PR of 1.62 (95% confidence interval [CI]: 1.17–

2.25)) subscales OHIP-14K showed an association with dry mouth in medication subgroup. The prevalence ratio of functional limitation (FL) subscale OHIP-14K is greater at non-medication (adjusted PR of 1.64 (95% confidence interval [CI]: 1.11-2.42)) than medication subgroup (adjusted PR of 1.41 (95% confidence interval [CI]: 1.09-1.82)). The prevalence ratio of psychological disability (PSY\_DISAB) at medication (adjusted PR of 1.62 (95% confidence interval [CI]: 1.17-2.25)) subscale OHIP-14K is greater than that of physical disability (P\_DISAB) subscale OHIP-14K at non-medication subgroup (adjusted PR of 1.53 (95% confidence interval [CI]: 1.00-2.33)). In handling the results from denture wearing-stratified analysis, most OHIP scores except handicap showed an association with dry mouth in denture wearing subgroup. The prevalence ratio of social disability (SOC\_DISAB) subscale OHIP-14K in denture wearing subgroup (adjusted PR of 2.21 (95% confidence interval [CI]: 1.25-3.93)) is greater in all prevalence ratios in this data.

## **IV. Discussion**

Dry mouth has been associated with oral health related quality of life. Studies in New Zealand, Canada and Korea reported that dry mouth affected OHIP scores with respect to all examined domains (Lee, 2006; Matear et al., 2006; Park, 2010; Thomson et al., 2006). However, those studies have shortcomings. They usually included older participants or only young adults in their early thirties (Thomson et al., 2006) or they surveyed for the residents of senior halls (Lee, 2006; Matear et al., 2006; Park, 2010). Moreover, they were not fully adjusted for potential confounders such as diabetes, hypertension and obesity, and didn't conduct subgroup analysis for their data. Our data showed that dry mouth is associated with OHIPs after controlling for various confounders. Our data

has some strong points. Our study was conducted in general population of which age ranged from 49 to 93, thus this is more representative than other (Lee, 2006; Matear et al., 2006; Park, 2010; Thomson et al., 2006). At the best of our knowledge, our data were adjusted for various potential known confounders such as medical compromised factor such as diabetes, hypertension and obesity for the first time, and stratified analyses were also conducted for the first time. Our data showed that dry mouth is associated with OHIP scores among Korean community dwelling adults, hence supporting previous studies.

The prevalence of dry mouth was 44.2% which is almost mid-point of the prevalence in the other studies (12~76.7%) with the elderly population (Gilbert et al., 1993; Narhi, 1994; Nederfors et al., 1997; Thomson et al., 1999). We estimated the prevalence of dry mouth with the single-item approach. Our data showed that dry mouth was more prevalent in female (Lee, 2006; Park, 2010), non-smokers (Lee, 2006; Park, 2010), people taking medicine (Lee, 2006; Park, 2010; So et al., 2010) and people wearing denture (Park, 2010) than participants without dry mouth, which are consistent with previous studies, and dry mouth was more prevalent non-smokers, non-drinkers, those without diabetes than participants without dry mouth, which are inconsistent with previous studies (So et al., 2010) (Table 2).

Oral health related quality of life measured by OHIP-14 was increased by the dry mouth. Among each subscale of OHIP, psychological disability ( $R=0.29$ ,  $p<0.01$ ) and physical pain ( $R=0.27$ ,  $p<0.01$ ) were most strongly affected by the dry mouth. Social disability ( $R=0.11$ ,  $p=0.10$ ) was the least affected subscale. Also, total OHIP-14 score had a relationship

with the dry mouth. These results considerably agree with previous findings (Lee, 2006) (Figure 3).

Those with dry mouth had higher total and subscales of OHIP-14 scores with dry mouth than those without dry mouth, which is consistent with the previous studies (Lee, 2006; Matear et al., 2006; Thomson et al., 2006; (Locker, 2003) (Table 3). Our data showed dry mouth was associated with functional limitation (FL), physical pain (PP), psychological discomfort (PSY\_DISCOM), physical disability (P\_DISAB), and psychological disability (PSY\_DISAB), which is consistent with the previous studies (Table 5, 6). Dry mouth has been reported to affect important aspects of life. Those with dry mouth have a difficulty with speaking, mastication, swallowing, food ingesting and taste sensing and tend to have more dental caries, periodontal disease and discomfort when using the dental prosthesis using, which affects physical, functional, social, and psychological health (Cassolato and Turnbull, 2003; Ikebe et al., 2005). However, our data showed dry mouth was not associated with social disability (SOC\_DISAB) and handicap (HANDI) OHIP subscale scores, which is inconsistent with some previous studies (Cassolato and Turnbull, 2003; Ikebe et al., 2005), but is consistent with a Korean study (Lee, 2006). In fact, the subjective and individual discomfort or disability with dry mouth hardly makes those people have a problem with social interaction with other people in community dwelling level unless the dry mouth is very high or the survey was conducted in hospitals. In addition, the previous studies suggesting that dry mouth does not coincide with hyposalivation (Narhi, 1994) support that subjective oral dryness can't give them handicap such as totally unable to function or feeling general life unsatisfied. In Poisson regression analysis, there was an association between economic-level and psychological

discomfort OHIP subscale score (Table 6). Those people with higher economic levels might be easy to feel tense or self-conscious because of level of their life. They have economic means to solve their discomfort by physical pain or disability by treatment in dental clinics. Our data showed diabetes was associated with physical pain in Poisson regression analysis (Table 6). Previous studies showed there is significant association between diabetes mellitus and periodontal disease (Emrich et al., 1991; Knowler et al., 1978; Nelson et al., 1990; Papapanou, 1996; Shlossman et al., 1990). The impact of oral health on the life quality of the periodontal diseases was considerable with substantial physical impacts; comfort and eating aspects, especially (Needleman et al., 2004). This makes people who have periodontal diseases because of diabetes feel physical pain on their lives. Our data showed all OHIP subscale scores except psychological discomfort were associated with denture wearing with controlling for confounders. Most participants in our study were rural dwelling for a long time, so they may be more aware of their discomfort and better at using with dentures because they had much time to adapting their current situation through denture status.

In the stratified analysis, the our data showed that the association between dry mouth and 5 subscale OHIP scores including functional limitation (FL), physical pain (PP), psychological discomfort (PSY\_DISCOM), physical disability (P\_DISAB) and psychological disability (PSY\_DISAB) was mainly highlighted in elders aged from 71 to 93 years, females, low economic-level, non-smokers, non-drinkers, non-diabetes, non-hypertension, non-obese, medication, and denture-wearers. Generally younger adults tend to be tolerable to functional limitation, disability, and discomfort. The older people are, the lower the threshold of sensitivity is. Thus the

impact of dry mouth is stronger in elders (>70 years old). Generally females are affected by psychological status, such as anxiety and depression (Bergdahl and Bergdahl, 2001; Bergdahl et al., 1997), and the prevalence of psychological symptoms or diseases is reported to be higher in women than in men (Grushka, 1987; Riley and Gilbert, 2001). Thus the impact of dry mouth on OHIP scores may be higher in females. People in low economic level are usually less healthy than those in high economic level. The previous studies suggested that socioeconomic status (SES) is associated with the levels of oral health. People in low economic level could be easily affected by various disability and discomfort because of dry mouth (Thomson et al., 2004). Psycho-social aspects were strongly embodied in the oral health-related quality of life of people in a Finnish national study (Eriksson and Lindström, 2006). Denture wearers are usually less healthy than those without denture. Insufficient saliva makes interface between oral mucosa and denture base be lack of retention. Dry mouth exacerbates oral health of denture wearers. Thus the impact of dry mouth is stronger in people in low economic level and denture wearers. Alcohol has volatility and irritability. Chronic alcohol consumption causes oral mucosal atrophy associated with hyper-regeneration, which may decrease sensation of dryness (Maier et al., 1994). Thus drinkers are less impacted by physical pain, disability, discomfort and functional limitation than by psychological discomfort, disability and social disability. Materials like nicotine in tobacco make mucous membrane of oral cavity keratinized (Grando, 1997), and then smokers' mucosal feeling decreases. Thus smokers usually can't feel the discomfort and disability from the dry mouth in their life. These impacts of drinking and smoking could mask the impact of dry mouth on OHIP scores. Medical conditions such as diabetes, hypertension, and obesity are common chronic

diseases in adults and usually give various symptoms and discomforts to people. People with diabetes usually have symptom of dry mouth (Moore et al., 2001). Medication of hypertension or obesity alters salivation of the people (Suvan and D' Aiuto, 2013), but these systemic diseases may have stronger impact to oral health related quality of life than dry mouth does. Thus the impact of dry mouth on OHIP scores could be masked by those much stronger factors. Obese people might be more sensitive to functional limitation and physical disability by dry mouth during tasting, masticating and swallowing than non-obese people because they tend to have much appetite. In people who don't take any medicine, the practical parts of life such as activity and exercise may affect them than the psychological parts of that such as feeling. In people who take medicine, it may work in the opposite way. In addition, people who take some medicines tend to already have the physical limitation because many anticholinergic drugs cause hyposalivation of salivary system. (Turner and Ship, 2007). Thus impact of dry mouth could be stronger in psychological subscale of OHIP scores such as psychological discomfort (PSY\_DISCOM), and psychological disability (PSY\_DISAB). People who don't take any medicine could feel more uncomfortable in functional and physical limitation by dry mouth than in psychological discomfort or disability.

This study is based on a cross-sectional design that does not allow inferring the causative effect of the variables effectively. For future investigations, one might consider a longitudinal study, which would explain the cause and effect relationships between dry mouth and OHIP scores. Due to the limited sample size used in the stratified analyses of this study, larger studies will call for further support this data.

## V. Conclusion

Our data showed that dry mouth was independently associated with OHIP-14K: total and 5 subscales except social disability and handicap among Korean community adults. The links was highlighted in elders aged 71-93 years, females, those with low economic-level, non-smokers, non-drinkers, those without diabetes, non-hypertensives, non-obese adults, those with non-medication, and denture-wearers. Thus, dry mouth is substantial health problem that affects oral health related quality of life.

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# VII. Figures and Tables

## Background

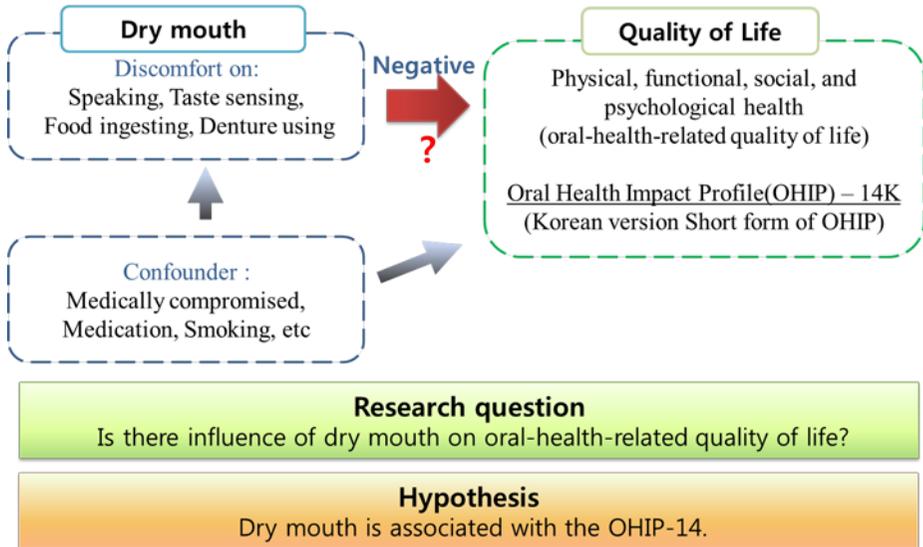


Figure 1. Association between dry mouth and OHIP

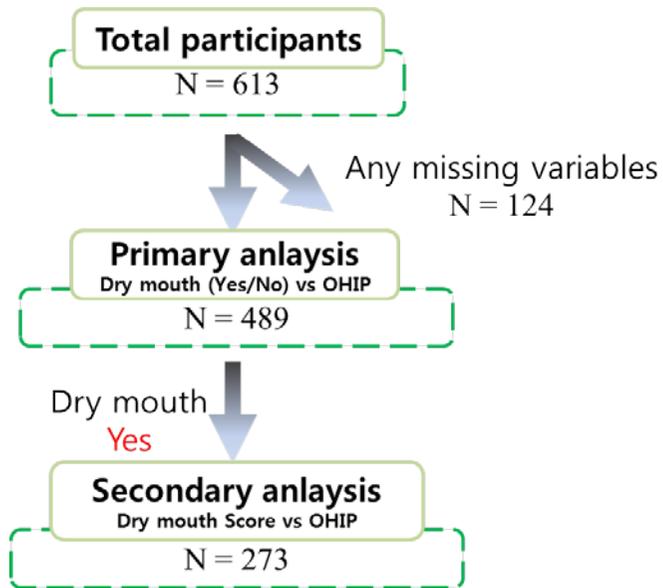
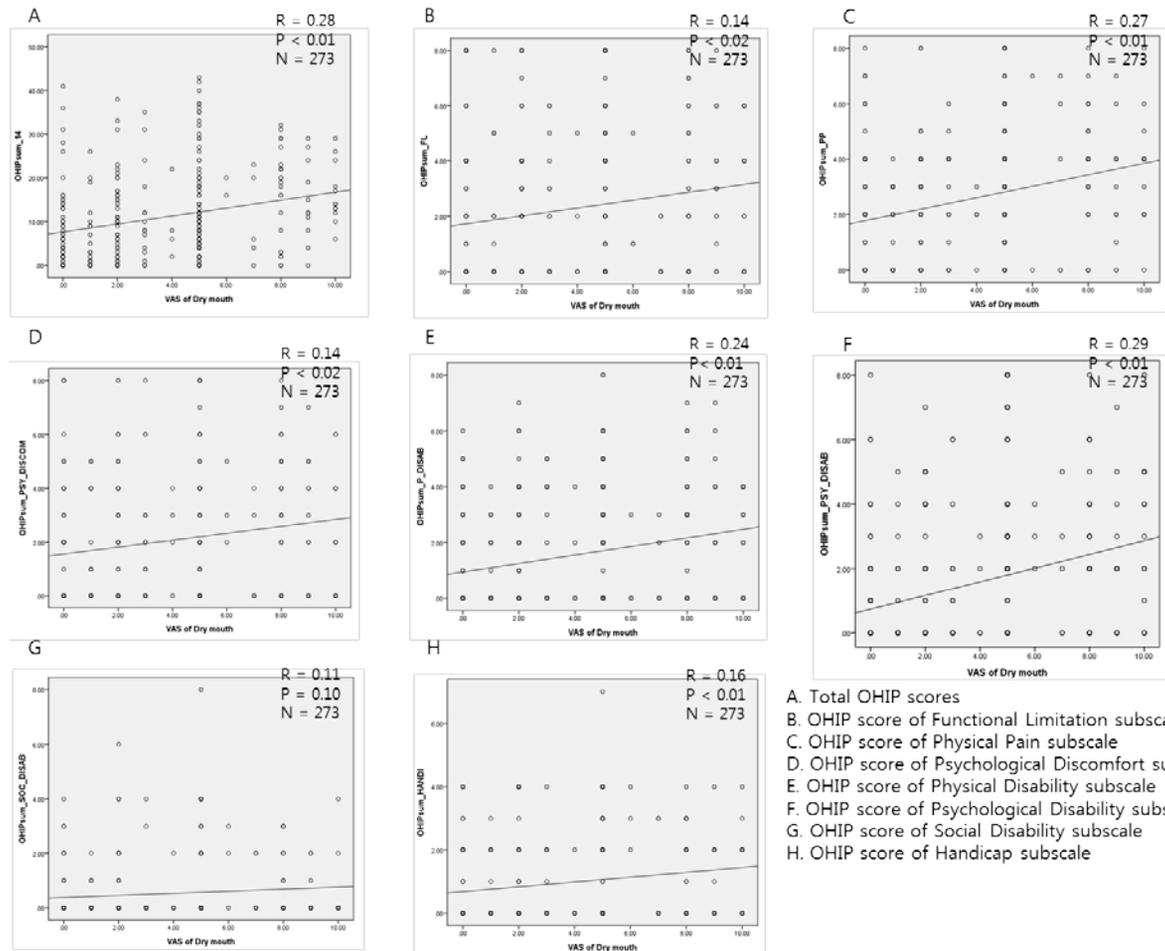


Figure 2. Flow chart for participants' recruitment



- A. Total OHIP scores
- B. OHIP score of Functional Limitation subscale
- C. OHIP score of Physical Pain subscale
- D. OHIP score of Psychological Discomfort subscale
- E. OHIP score of Physical Disability subscale
- F. OHIP score of Psychological Disability subscale
- G. OHIP score of Social Disability subscale
- H. OHIP score of Handicap subscale

Figure 3. Spearman correlation between the dry mouth and OHIP scores

Table 1. OHIP-14 individual items

OHIP-14 items	Scoring				
	Never (0)	Hardly ever (1)	Occasionally (2)	Fairly often (3)	Very often (4)
<b>Functional limitation</b>					
Have you had trouble pronouncing any words?	-----	-----	-----	-----	-----
Have you felt that your sense of taste has worsened?	-----	-----	-----	-----	-----
<b>Physical pain</b>					
Have you had painful aching in your mouth?	-----	-----	-----	-----	-----
Have you found it uncomfortable to eat any foods?	-----	-----	-----	-----	-----
<b>Psychological discomfort</b>					
Have you been self-conscious?	-----	-----	-----	-----	-----
Have you felt tense?	-----	-----	-----	-----	-----
<b>Physical disability</b>					
Has your diet been unsatisfactory?	-----	-----	-----	-----	-----
Have you had to interrupt meals?	-----	-----	-----	-----	-----
<b>Psychological disability</b>					
Have you found it difficult to relax?	-----	-----	-----	-----	-----
Have you been a bit embarrassed?	-----	-----	-----	-----	-----
<b>Social disability</b>					
Have you been a bit irritable with other people?	-----	-----	-----	-----	-----
Have you had difficulty doing your usual jobs?	-----	-----	-----	-----	-----
<b>Handicap</b>					
Have you felt that life in general was less satisfying?	-----	-----	-----	-----	-----
Have you been totally unable to function?	-----	-----	-----	-----	-----

Table 2. Distribution of Confounders by Dry mouth (n=489)

Variables	Total N N(%)	Dry mouth		p-value*
		No (n = 216)	Yes (n = 273)	
Age (years), n(%)	489			0.53
49–70	230(47.0)	105(48.6)	125(45.8)	
>70	259(53.0)	111(51.4)	148(54.2)	
Gender, n(%)	489			<0.01
Male	173(35.4)	<b>105(48.6)</b>	<b>68(24.9)</b>	
Female	316(64.6)	<b>111(51.4)</b>	<b>205(75.1)</b>	
Economic-level, n(%)	489			0.35
Low	281(57.5)	119(55.1)	162(59.3)	
High	208(42.5)	97(44.9)	111(40.7)	
Present smoking, n(%)	489			<0.01
No	304(62.2)	<b>119(55.1)</b>	<b>185(67.8)</b>	
Yes	185(37.8)	<b>97(44.9)</b>	<b>88(32.2)</b>	
Alcohol drinking, n(%)	489			0.10
No	314(64.2)	130(60.2)	184(67.4)	
Yes	175(35.8)	86(39.8)	89(32.6)	
Diabetes, n(%)	489			0.05
No	395(80.8)	166(76.9)	229(83.9)	
Yes	94(19.2)	50(23.1)	44(16.1)	
Hypertension, n(%)	489			0.71
No	349(71.4)	156(72.2)	193(70.7)	
Yes	140(28.6)	60(27.8)	80(29.3)	
Obesity, n(%)	489			0.57
No	251(51.3)	114(52.8)	137(50.2)	
Yes	238(48.7)	102(47.2)	136(49.8)	
Medication, n(%)	489			<0.01
No	154(31.5)	<b>82(38.0)</b>	<b>72(26.4)</b>	
Yes	335(68.5)	<b>134(62.0)</b>	<b>201(73.6)</b>	
Wearing denture, n(%)	489			<0.01
No	211(43.1)	<b>108(50.0)</b>	<b>103(37.7)</b>	
Yes	278(56.9)	<b>108(50.0)</b>	<b>170(62.3)</b>	

\*p-value Obtained from  $\chi^2$ -test.Bold denotes  $p < 0.05$ .

Table 3. Mean (Standard Deviation) value of OHIP-14K scores and subscale scores by dry mouth (n=489)

OHIP-14 score	Dry mouth		p-value*
	No (n = 216)	Yes (n = 273)	
Total sum (0~56)	6.87(8.17)	11.03(10.24)	<0.01
Functional Limitation (0~8)	1.16(2.00)	2.15(2.54)	<0.01
Physical Pain (0~8)	1.75(1.92)	2.50(2.24)	<0.01
Psychological Discomfort (0~8)	1.33(2.11)	1.98(2.36)	0.04
Physical Disability (0~8)	0.73(1.32)	1.45(1.92)	<0.01
Psychological Disability (0~8)	0.88(1.79)	1.54(2.12)	<0.01
Social Disability (0~8)	0.29(0.83)	0.49(1.07)	<0.01
Handicap (0~8)	0.73(1.32)	0.92(1.28)	<b>0.11</b>

\*Obtained from Mann-Whitney Test.

Bold denotes  $p < 0.05$ .

Table 4. Prevalence of OHIP-14K (very often or fairly often) by Dry Mouth (n=489)

OHIP-14 score	Dry mouth		p-value*	Crude prevalence ratio †
	No (n=216)	Yes (n=273)		
Total sum, prev(n)	72.2(156)	84.2(230)	<0.01	1.17(1.06-1.29)
Functional Limitation, prev(n)	33.3(72)	53.1(145)	<0.01	1.59(1.28-1.98)
Physical Pain, prev(n)	47.7(103)	62.3(170)	<0.01	1.31(1.11-1.54)
Psychological Discomfort, prev(n)	38.4(83)	53.1(145)	<0.01	1.38(1.13-1.69)
Physical Disability, prev(n)	27.8(60)	44.0(120)	<0.01	1.58(1.23-2.04)
Psychological Disability, prev(n)	27.8(60)	45.8(125)	<0.01	1.65(1.28-2.12)
Social Disability, prev(n)	13.0(28)	20.5(56)	0.03	1.58(1.04-2.40)
Handicap, prev(n)	30.1(65)	38.8(106)	<0.05	1.29(1.00-1.66)

\*Obtained from  $\chi^2$  -test.

† Obtained from Poisson regression analysis. ( ): 95% confidence interval.

Table 5. Adjusted association between dry mouth and prevalence of total OHIP-14K (n=489)

Variables	Prevalence ratio*			
	Model I	Model II	Model III	Model IV
Dry mouth				
No	<b>1</b>	<b>1</b>	<b>1</b>	<b>1</b>
Yes	<b>1.16(1.05-1.29)</b>	<b>1.16(1.05-1.29)</b>	<b>1.17(1.05-1.29)</b>	<b>1.16(1.05-1.28)</b>
Age (years)				
49-70	1	1	1	1
>70	1.04(0.95-1.14)	1.04(0.94-1.14)	1.03(0.94-1.13)	1.01(0.92-1.11)
Gender				
Male	1	1	1	1
Female	1.00(0.90-1.10)	1.05(0.92-1.21)	1.06(0.92-1.21)	1.03(0.90-1.18)
Economic-level				
Low	1	1	1	1
High	0.98(0.89-1.07)	0.98(0.89-1.08)	0.99(0.90-1.09)	0.99(0.91-1.09)
Present smoking				
No		1	1	1
Yes		1.07(0.94-1.21)	1.06(0.94-1.21)	1.05(0.92-1.19)
Alcohol drinking				
No		1	1	1
Yes		1.02(0.92-1.13)	1.02(0.91-1.13)	1.02(0.91-1.13)
Diabetes				
No			<b>1</b>	<b>1</b>
Yes			<b>1.12(1.01-1.24)</b>	<b>1.12(1.01-1.25)</b>
Hypertension				
No			1	1
Yes			1.05(0.95-1.15)	1.05(0.96-1.16)
Obesity				
No			1	1
Yes			0.94(0.85-1.03)	0.94(0.86-1.04)
Medication				
No			1	1
Yes			1.03(0.93-1.14)	1.03(0.93-1.14)
Wearing denture				
No				1
Yes				<b>1.10(1.00-1.22)</b>

\*Prevalence ratio is obtained from Poisson regression analysis and adjusted for confounders (Model I: age, gender, economic-level, Model II: all variables in model I plus smoking and alcohol drinking, Model III: all variables in model I plus diabetes, hypertension, obesity and medication, Model IV: all variables in model I plus wearing denture). ( ): 95% confidence interval.

Bold denotes p<0.05.

Table 6. Adjusted association between dry mouth and prevalence of subscale OHIP-14K (n=489)

Variables	Prevalence ratio*(95% confidence interval)						
	FL	PP	PSY_DISCOM	P_DISAB	PSY_DISAB	SOC_DISAB	HANDI
Dry mouth							
No	<b>1</b>	<b>1</b>	<b>1</b>	<b>1</b>	<b>1</b>	<b>1</b>	<b>1</b>
Yes	<b>1.49(1.20–1.84)</b>	<b>1.32(1.11–1.56)</b>	<b>1.36(1.11–1.67)</b>	<b>1.49(1.16–1.92)</b>	<b>1.62(1.26–2.10)</b>	1.45(0.96–2.21)	1.28(0.99–1.64)
Age (years)							
49–70	<b>1</b>	<b>1</b>	<b>1</b>	<b>1</b>	<b>1</b>	<b>1</b>	<b>1</b>
>70	1.14(0.94–1.38)	1.13(0.96–1.33)	0.94(0.78–1.14)	1.25(0.98–1.58)	1.04(0.83–1.31)	0.98(0.67–1.44)	1.04(0.82–1.32)
Gender							
Male	<b>1</b>	<b>1</b>	<b>1</b>	<b>1</b>	<b>1</b>	<b>1</b>	<b>1</b>
Female	1.04(0.78–1.38)	1.04(0.83–1.30)	1.17(0.89–1.55)	1.10(0.80–1.50)	1.04(0.75–1.44)	1.03(0.57–1.85)	1.14(0.81–1.59)
Economic-level							
Low	<b>1</b>	<b>1</b>	<b>1</b>	<b>1</b>	<b>1</b>	<b>1</b>	<b>1</b>
High	1.03(0.85–1.24)	1.01(0.87–1.18)	<b>1.25(1.04–1.49)</b>	0.95(0.76–1.20)	0.96(0.76–1.21)	0.94(0.64–1.39)	1.03(0.81–1.30)
Present smoking							
No	<b>1</b>	<b>1</b>	<b>1</b>	<b>1</b>	<b>1</b>	<b>1</b>	<b>1</b>
Yes	1.05(0.81–1.36)	1.00(0.82–1.23)	1.04(0.80–1.36)	1.11(0.83–1.47)	0.96(0.71–1.31)	0.84(0.48–1.45)	1.20(0.87–1.64)
Alcohol drinking							
No	<b>1</b>	<b>1</b>	<b>1</b>	<b>1</b>	<b>1</b>	<b>1</b>	<b>1</b>
Yes	1.09(0.88–1.34)	1.01(0.85–1.20)	0.83(0.67–1.04)	1.02(0.80–1.30)	0.91(0.71–1.16)	0.92(0.61–1.40)	1.04(0.80–1.34)
Diabetes							
No	<b>1</b>	<b>1</b>	<b>1</b>	<b>1</b>	<b>1</b>	<b>1</b>	<b>1</b>
Yes	0.89(0.69–1.16)	<b>1.23(1.03–1.48)</b>	1.11(0.89–1.39)	0.90(0.66–1.22)	1.20(0.91–1.57)	1.00(0.61–1.64)	1.05(0.78–1.41)
Hypertension							
No	<b>1</b>	<b>1</b>	<b>1</b>	<b>1</b>	<b>1</b>	<b>1</b>	<b>1</b>
Yes	1.03(0.84–1.27)	0.94(0.79–1.11)	1.20(0.98–1.46)	1.09(0.85–1.38)	1.15(0.91–1.46)	0.92(0.60–1.43)	1.05(0.81–1.36)
Obesity							
No	<b>1</b>	<b>1</b>	<b>1</b>	<b>1</b>	<b>1</b>	<b>1</b>	<b>1</b>
Yes	0.86(0.71–1.04)	0.84(0.72–0.99)	0.93(0.77–1.12)	0.88(0.70–1.10)	0.99(0.79–1.24)	1.02(0.70–1.49)	0.86(0.68–1.09)
Medication							
No	<b>1</b>	<b>1</b>	<b>1</b>	<b>1</b>	<b>1</b>	<b>1</b>	<b>1</b>
Yes	1.14(0.92–1.42)	1.03(0.86–1.23)	1.15(0.93–1.43)	1.06(0.82–1.36)	0.93(0.72–1.18)	1.09(0.71–1.68)	1.04(0.80–1.35)
Wearing denture							
No	<b>1</b>	<b>1</b>	<b>1</b>	<b>1</b>	<b>1</b>	<b>1</b>	<b>1</b>
Yes	<b>1.84(1.45–2.34)</b>	<b>1.21(1.02–1.44)</b>	1.15(0.94–1.39)	<b>1.53(1.18–1.98)</b>	<b>1.40(1.10–1.80)</b>	<b>1.84(1.19–2.85)</b>	<b>1.69(1.28–2.23)</b>

\*Prevalence ratio is obtained from Poisson regression analysis adjusted for all variables in Table 5 using Model IV. ( ): 95% confidence interval.

Bold denotes  $p < 0.05$ .

Table 7. Stratified adjusted association between Dry mouth (Yes) and prevalence of total and subscale OHIP scores (n=489)

	Subgroup	N	Prevalence ratio*(95% confidence interval)							
			Total sum	FL	PP	PSY_DISCOM	P_DISAB	PSY_DISAB	SOC_DISAB	HANDI
Age (years)	49-70	231	<b>1.22(1.03-1.44)</b>	<b>1.47(1.03-2.10)</b>	<b>1.45(1.10-1.93)</b>	1.04(0.78-1.38)	1.40(0.91-2.14)	1.37(0.94-2.00)	1.08(0.57-2.06)	1.25(0.84-1.85)
	>70	258	1.12(0.98-1.28)	<b>1.50(1.15-1.95)</b>	1.22(0.98-1.51)	<b>1.75(1.30-2.36)</b>	<b>1.51(1.11-2.05)</b>	<b>1.86(1.31-2.64)</b>	<b>1.78(1.02-3.09)</b>	1.28(0.93-1.76)
Gender	Male	174	1.03(0.87-1.21)	1.04(0.74-1.45)	1.11(0.83-1.47)	1.10(0.77-1.57)	1.27(0.85-1.92)	1.28(0.84-1.94)	1.69(0.82-3.46)	1.02(0.67-1.54)
	Female	315	<b>1.25(1.09-1.43)</b>	<b>1.85(1.36-2.51)</b>	<b>1.46(1.17-1.82)</b>	<b>1.54(1.18-2.00)</b>	<b>1.69(1.21-2.36)</b>	<b>1.84(1.32-2.58)</b>	1.31(0.79-2.17)	<b>1.50(1.07-2.09)</b>
Economic-level	Low	281	<b>1.22(1.06-1.40)</b>	<b>1.59(1.19-2.14)</b>	<b>1.33(1.06-1.66)</b>	<b>1.55(1.14-2.10)</b>	1.37(0.99-1.88)	<b>1.78(1.27-2.50)</b>	<b>2.04(1.13-3.71)</b>	1.38(0.99-1.93)
	High	208	1.08(0.93-1.26)	1.30(0.95-1.77)	1.24(0.96-1.61)	1.17(0.89-1.53)	<b>1.55(1.04-2.31)</b>	1.41(0.96-2.08)	0.87(0.45-1.70)	1.11(0.76-1.62)
Present smoking	Non-smoker	304	<b>1.20(1.05-1.38)</b>	<b>1.65(1.23-2.23)</b>	<b>1.42(1.14-1.79)</b>	<b>1.49(1.15-1.93)</b>	<b>1.65(1.18-2.31)</b>	<b>1.88(1.34-2.64)</b>	1.30(0.78-2.16)	<b>1.44(1.03-2.01)</b>
	smoker	185	1.11(0.95-1.29)	1.30(0.95-1.78)	1.18(0.90-1.55)	1.22(0.87-1.72)	1.36(0.92-2.02)	1.35(0.89-2.04)	1.91(0.93-3.92)	1.15(0.78-1.69)
Alcohol drinking	Non-drinking	314	<b>1.17(1.03-1.34)</b>	<b>1.60(1.20-2.14)</b>	<b>1.37(1.10-1.70)</b>	1.27(0.99-1.62)	<b>1.60(1.15-2.24)</b>	<b>1.57(1.14-2.16)</b>	1.07(0.66-1.73)	1.38(0.99-1.91)
	drinking	175	1.15(0.98-1.35)	1.36(0.98-1.88)	1.25(0.95-1.66)	<b>1.54(1.07-2.23)</b>	1.35(0.91-2.00)	<b>1.73(1.15-2.61)</b>	<b>2.77(1.26-6.13)</b>	1.12(0.76-1.66)
Diabetes	Non-diabetes	395	<b>1.23(1.09-1.40)</b>	<b>1.57(1.24-2.00)</b>	<b>1.41(1.15-1.72)</b>	<b>1.50(1.18-1.91)</b>	<b>1.50(1.13-1.99)</b>	<b>1.75(1.29-2.36)</b>	1.41(0.90-2.22)	1.30(0.98-1.72)
	Diabetes	94	0.89(0.75-1.06)	1.20(0.73-1.96)	0.99(0.71-1.36)	0.86(0.58-1.28)	1.30(0.75-2.25)	1.16(0.69-1.94)	1.37(0.47-3.99)	1.17(0.67-2.03)
Hypertension	Normal	349	<b>1.21(1.07-1.38)</b>	<b>1.65(1.28-2.14)</b>	<b>1.38(1.13-1.69)</b>	<b>1.55(1.19-2.02)</b>	<b>1.61(1.19-2.18)</b>	<b>1.67(1.23-2.28)</b>	1.38(0.86-2.22)	<b>1.36(1.01-1.83)</b>
	Abnormal	140	1.03(0.87-1.21)	1.11(0.75-1.65)	1.15(0.83-1.57)	1.04(0.75-1.44)	1.25(0.80-1.97)	1.47(0.93-2.32)	2.06(0.90-4.69)	1.12(0.71-1.75)
Obesity	Non-obese	250	<b>1.17(1.03-1.33)</b>	<b>1.42(1.09-1.85)</b>	<b>1.35(1.09-1.68)</b>	<b>1.40(1.06-1.85)</b>	<b>1.42(1.04-1.94)</b>	<b>1.68(1.20-2.35)</b>	1.69(0.97-2.95)	1.15(0.85-1.57)
	Obese	239	1.13(0.95-1.34)	<b>1.61(1.12-2.33)</b>	1.25(0.94-1.66)	1.33(0.98-1.80)	<b>1.62(1.08-2.43)</b>	<b>1.48(1.00-2.18)</b>	1.26(0.66-2.41)	1.49(0.98-2.28)
Medication	Non-medication	154	<b>1.23(1.02-1.48)</b>	<b>1.64(1.11-2.42)</b>	1.28(0.95-1.72)	1.43(0.98-2.10)	<b>1.83(1.14-2.94)</b>	<b>1.53(1.00-2.33)</b>	1.20(0.60-2.39)	1.17(0.76-1.80)
	Medication	335	1.13(0.99-1.27)	<b>1.41(1.09-1.82)</b>	<b>1.33(1.08-1.64)</b>	<b>1.30(1.02-1.65)</b>	1.33(0.98-1.79)	<b>1.62(1.17-2.25)</b>	1.45(0.84-2.50)	1.30(0.96-1.77)
Wearing denture	Non-denture wearer	211	1.07(0.90-1.27)	1.54(0.98-2.41)	1.31(0.97-1.77)	1.00(0.73-1.38)	1.50(0.95-2.38)	1.19(0.77-1.83)	0.63(0.29-1.41)	1.34(0.83-2.15)
	Denture wearer	278	<b>1.21(1.06-1.38)</b>	<b>1.44(1.13-1.83)</b>	<b>1.30(1.06-1.61)</b>	<b>1.68(1.27-2.23)</b>	<b>1.50(1.11-2.03)</b>	<b>1.86(1.33-2.59)</b>	<b>2.21(1.25-3.93)</b>	1.25(0.93-1.67)

\*Prevalence ratio is obtained from Poisson regression analysis adjusted for all variables in Table 5 using Model IV. ( ): 95% confidence interval.

FL denotes functional limitation, PP denotes physical pain, PSY\_DISCOM denotes psychological discomfort, P\_DISAB denotes physical disability, PSY\_DISAB denotes psychological disability, SOC\_DISAB denotes social disability, and HANDI denotes handicap.

Bold denotes  $p < 0.05$ .

# 초 록

## 1. 연구목적

구강 건조증은 사람들, 특히 성인에게서 불편함을 일으키는 증상으로 알려져 있다. 최근 연구에 의하면 구강 건조증은 고령자의 삶에 영향을 미친다고 밝히고 있는데도 불구하고, 넓은 성인 연령대를 포함하거나 전신질환의 요소를 보정한 상관성을 파악한 연구들은 찾아볼 수 없었다. 따라서 본 연구에서는 전신질환의 혼란 변수를 포함하여 고령자를 포함한 한국 성인을 대상으로 구강 건조증이 구강건강 관련 삶의 질에 어떤 영향을 미치는 지 알아보하고자 하였다.

## 2. 연구방법

본 연구는 순창 장수 코호트 연구조사에서 49세에서 93세 이하 성인 남녀 489명을 대상으로 한 횡단면 연구조사이다. 구강 건조증 여부는 한 개의 질문과 VAS 척도로 측정되었으며, 구강건강 관련 삶의 질은 한국형으로 제작된 구강 건강 영향 지수-14K (Oral Health Impact Profile-14K)로 평가되었다. 모든 정보들과 혼란 변수들은 인터뷰를 통하여 기록 되었다. 카이 제곱 검정과 Spearman 상관 분석을 통하여 구강 건조증과 구강 건강 영향 지수-14K 사이의 관계를 알아 보았다. 그리고, 구강 건조증과 구강 건강 영향 지수-14K를 혼란 변수들 보정을 통하여 Poisson 회기 분석으로 알아 보았다.

## 3. 연구결과

구강 건강 영향 지수-14K의 총 합의 평균과 유병률에 대하여 구강 건조증 유무를 통해서 비교하였을 때, 구강 건조증이 있는 경우 평균값(11.03; 표준편차 10.24)과 유병률(84.2%)이 구강 건조증이 없는 경우의 평균값(6.87; 표준편차 8.17)과 유병률(72.2%)에 비하여 높은 값을 가지는 것으로 밝혀졌으며

통계적으로 유의성(유의확률 < 0.01)을 가졌다. 구강 건조증의 정도와 구강 건강 영향 지수-14K 항목의 점수 사이에서도 유의성이 나타났다. 혼란 변수들을 보정하여 분석한 결과, 구강 건강 영향 지수-14K 항목 총합의 유병률(보정 유병률: 1.16) 및 다섯 가지의 하위그룹(functional limitation(보정 유병률: 1.49), physical pain(보정 유병률: 1.32), psychological discomfort(보정 유병률: 1.36), physical disability(보정 유병률: 1.49) and psychological disability(보정 유병률: 1.62))의 유병률에서 구강 건조증과의 연관성을 찾을 수 있었다. 71세에서 93세 이하의 고연령, 여성, 하위 경제수준, 비흡연자, 비음주자, 정상 당 수치를 가진 사람, 정상 혈압인, 정상 체중인, 약물 비복용자 그리고 의치 착용자 그룹에서 구강 건조증과 위의 다섯 가지의 하위그룹 및 총합 구강 건강 영향 지수-14K 사이에서 연관성이 두드러지게 나타났다.

#### 4. 결론

본 연구에서는 가능성 있는 혼란 변수들을 보정 과정을 통하여 성인에서 구강 건조증과 구강 건강 영향 지수-14K 사이에서 연관성을 확인할 수 있었다. 결론적으로, 구강 건조증은 구강건강 관련 삶의 질에 큰 영향을 줄 수 있는 중요한 건강상의 문제임을 확인할 수 있었다.

**주요어:** 구강 건조증, 구강건강 관련 삶의 질, 구강건강영향지수-14K (OHIP-14K), 층화 분석, 보정 유병률

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