

DENTAL SERVICES UTILIZATION, ORAL STATUS, AND ORAL HEALTH-RELATED QUALITY
OF LIFE AMONG THAI ELDERLY: DATA FROM THE EIGHT THAILAND NATIONAL ORAL
HEALTH SURVEY



A Thesis Submitted in Partial Fulfillment of the Requirements
for the Degree of Master of Science in Geriatric Dentistry and Special Patients Care

Common Course

FACULTY OF DENTISTRY

Chulalongkorn University

Academic Year 2019

Copyright of Chulalongkorn University

การใช้บริการทันตสุขภาพ สภาวะช่องปาก และคุณภาพชีวิตในมิติสุขภาพช่องปากของผู้สูงอายุ
ไทย: ข้อมูลจากการสำรวจสภาวะสุขภาพช่องปากแห่งชาติครั้งที่ 8 ประเทศไทย



วิทยานิพนธ์นี้เป็นส่วนหนึ่งของการศึกษาตามหลักสูตรปริญญาวิทยาศาสตรมหาบัณฑิต
สาขาวิชาทันตกรรมผู้สูงอายุและการดูแลผู้ป่วยพิเศษ ไม่สังกัดภาควิชา/เทียบเท่า
คณะทันตแพทยศาสตร์ จุฬาลงกรณ์มหาวิทยาลัย
ปีการศึกษา 2562
ลิขสิทธิ์ของจุฬาลงกรณ์มหาวิทยาลัย

Thesis Title DENTAL SERVICES UTILIZATION, ORAL STATUS, AND
ORAL HEALTH-RELATED QUALITY OF LIFE AMONG THAI
ELDERLY: DATA FROM THE EIGHT THAILAND NATIONAL
ORAL HEALTH SURVEY

By Mr. Punkanit Harirugsakul

Field of Study Geriatric Dentistry and Special Patients Care

Thesis Advisor ISSARAPONG KAEWKAMNERDPONG, D.D.S., MPH, Ph.D.

Thesis Co Advisor Professor SUDADUANG KRISDAPONG, D.D.S., Ph.D.

Accepted by the FACULTY OF DENTISTRY, Chulalongkorn University in Partial
Fulfillment of the Requirement for the Master of Science

----- Dean of the FACULTY OF
DENTISTRY
(Assistant Professor SUCHIT POOLTHONG, D.D.S. Ph.D.)

THESIS COMMITTEE

----- Chairman
(Assistant Professor ORAPIN KOMIN, D.D.S., Ph.D.)

----- Thesis Advisor
(ISSARAPONG KAEWKAMNERDPONG, D.D.S., MPH, Ph.D.)

----- Thesis Co-Advisor
(Professor SUDADUANG KRISDAPONG, D.D.S., Ph.D.)

----- Examiner
(Associate Professor THANTRIRA PORNTAVEETUS, D.D.S.,
Ph.D.)

----- External Examiner
(Assistant Professor Nathawut Kaewsutha, D.D.S., MPH,
Ph.D.)

6075823232 : MAJOR GERIATRIC DENTISTRY AND SPECIAL PATIENTS CARE

KEYWORD: OLDER ADULTS, DENTAL SERVICE UTILIZATION, ORAL STATUS, ORAL HEALTH RELATED QUALITY OF LIFE, NATIONAL SURVEY

Punkanit Harirugsakul : DENTAL SERVICES UTILIZATION, ORAL STATUS, AND ORAL HEALTH-RELATED QUALITY OF LIFE AMONG THAI ELDERLY: DATA FROM THE EIGHT THAILAND NATIONAL ORAL HEALTH SURVEY. Advisor: ISSARAPONG KAEWKAMNERDPONG, D.D.S., MPH, Ph.D. Co-advisor: Prof. SUDADUANG KRISDAPONG, D.D.S., Ph.D.

The number of older adults in Thailand is currently increasing. To create the appropriate oral health service for them requires understanding the associations between dental service utilization (DSU), oral status and oral health-related quality of life (OHRQoL). The objectives of this study were to examine the associations of DSU and oral status with OHRQoL and to examine the associations between social backgrounds and DSU in Thai older adults. Data on 4,130 Thai older adults from the 8th Thailand National Oral Health Survey were collected through interviews and oral examination. Chi-square test and multiple logistic regression models were applied. Thai older adults who lived in an urban area, had an income over 15,001 Baht, graduated middle school or more, entitled to civil servant medical benefit scheme, and were ex-smokers or never-smoked were more likely to visit a dental clinic. Thai older adults who had 27 teeth or more and 8 posterior occlusal pairs or more were more likely to have less difficulty eating. Difficulty eating, difficulty speaking and satisfaction with oral health were associated with DSU. In conclusion, Thai older adults with poor social backgrounds and smoking utilized less dental services. OHRQoL in Thai older adults, especially difficulty eating, was associated with income, DSU, posterior occlusal pairs and number of teeth.

Field of Study: Geriatric Dentistry and
Special Patients Care

Student's Signature

Academic Year: 2019

Advisor's Signature

Co-advisor's Signature

ACKNOWLEDGEMENTS

I would like to express my special gratitude to my advisor Doctor Issarapong Kaewkamnerdpong, you have been a wonderful mentor for me. I would like to thank you for encouraging my research and for allowing me to grow as a better person. Your advice on research and life have been priceless.

I would like to thank the Bureau of Dental Health, Department of Health, Ministry of Public Health for the data support of this master study. I would like to thank geriatric dentistry students and staffs. All of you have been there to support me when I fall. I would also like to thank my families who supported me toward my study.

Punkanit Harirugsakul



TABLE OF CONTENTS

	Page
ABSTRACT (THAI)	iii
ABSTRACT (ENGLISH)	iv
ACKNOWLEDGEMENTS	v
TABLE OF CONTENTS	vi
LIST OF TABLES	ix
LIST OF FIGURES.....	xi
CHAPTER 1 INTRODUCTION	12
CHAPTER 2 REVIEW OF LITERATURE.....	13
2.1 Health-related quality of life (HRQoL) and oral health-related quality of life (OHRQoL)	13
2.2 Tooth loss and its association with OHRQoL	14
2.3 Prosthesis status and prosthesis need and their associations with OHRQoL.....	16
2.4 Xerostomia and its association with OHRQoL.....	17
2.5 Oral status, health status and their associations with OHRQoL	18
2.6 Dental service utilization (DSU) and its association with OHRQoL.....	19
2.7 Oral behaviors and their associations with OHRQoL	20
2.8 Social backgrounds and OHRQoL.....	20
2.8.1 Socio demographic and economic status (SDES)	20
2.8.2 Capacity of older adults	21
2.8.3 Social welfare	22
2.9 Summary	22

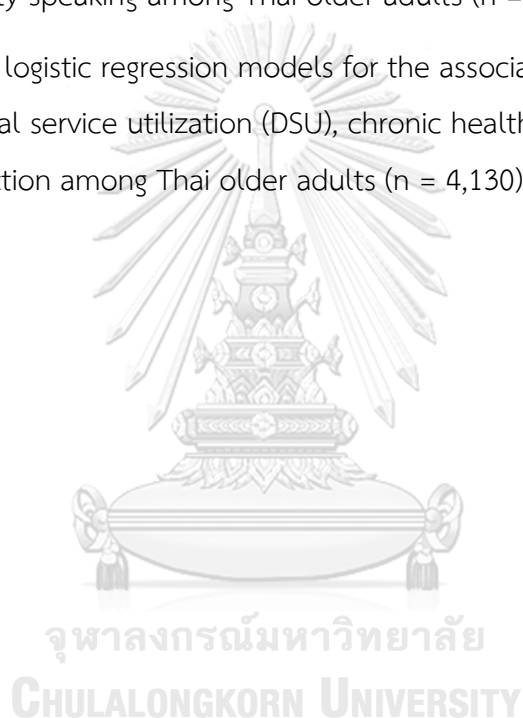
2.10 Research Questions	23
2.11 Research Objectives	23
2.12 Research Conceptual Framework	24
CHAPTER 3 RESEARCH METHODOLOGY	25
3.1 Sample	25
3.2 Data collection.....	26
3.3 Study implementation.....	28
3.3.1 Permission	28
3.3.2 Preparation of document.....	28
3.3.3 Training and calibration exercises.....	28
3.3.4 Implementation steps.....	29
3.4 Data analysis.....	29
3.4.1 Descriptive statistics.....	29
3.4.2 Bivariate analysis.....	30
3.4.3 Multivariate regression model.....	30
3.5 Research Hypothesis.....	30
CHAPTER 4 RESULTS	33
4.1 Descriptive results.....	33
4.1.1 Social backgrounds.....	33
4.1.2 Oral behaviors	34
4.1.3 DSU.....	35
4.1.4 Chronic health conditions	35
4.1.5 Oral status	36
4.1.6 OHRQoL.....	38

4.2 Associations of social backgrounds, oral behaviors, and OHRQoL with DSU	39
4.3 Associations of social backgrounds, DSU, chronic health conditions, and oral status with OHRQoL	42
4.3.1 Associations between social backgrounds and OHRQoL.....	42
4.3.2 Associations between DSU and OHRQoL	43
4.3.3 Associations between chronic health conditions and OHRQoL.....	44
4.3.4 Associations between oral status and OHRQoL.....	45
4.3.5 Association between oral status and OHRQoL (difficulty eating) adjusting for social backgrounds and DSU.....	47
4.3.6 Association between oral status and OHRQoL (difficulty speaking) adjusting for social backgrounds, chronic health conditions, and DSU.....	51
4.3.7 Association between oral status and OHRQoL (dissatisfaction) adjusting for social backgrounds, chronic health conditions, and DSU.....	52
CHAPTER 5 DISCUSSION AND CONCLUSION	54
5.1 Associations between social backgrounds, oral behaviors, OHRQoL, and DSU..	54
5.2 Associations of social backgrounds, DSU, chronic health conditions, and oral status with OHRQoL.....	58
5.3 Conclusion	68
REFERENCES.....	69
VITA	95

LIST OF TABLES

	Page
Table 1. Distribution of social backgrounds among Thai older adults (n= 4,130).	34
Table 2. Distribution of related oral behaviors among Thai older adults (n= 4,130). ..	35
Table 3. Distribution of dental service utilization (DSU) among Thai older adults (n= 4,130).	35
Table 4. Distribution of chronic health conditions among Thai older adults (n= 4,130).	35
Table 5. Distribution of oral status among Thai older adults (n= 4,130).	36
Table 6. Distribution of prosthesis conditions among Thai older adults (n= 4,130).	37
Table 7. Distribution of oral health-related quality of life among Thai older adults (n= 4,130).	38
Table 8. Association between social backgrounds, oral behaviors, oral health related quality of life and dental service utilization (DSU) in Thai older adults (n = 4,130).	40
Table 9. Multiple Logistic regression models for the association of social backgrounds, oral behaviors and oral health related quality of life with dental service utilization (DSU) among Thai older adults (n = 4,130).	41
Table 10. Associations between social backgrounds and oral health-related quality of life in Thai older adults (n = 4,130).	43
Table 11. Associations between dental service utilization (DSU) and oral health-related quality of life in Thai older adults (n = 4,130).	44
Table 12. Associations between chronic health conditions and oral health-related quality of life in Thai older adults (n = 4,130).	44
Table 13. Associations between oral status and oral health-related quality of life in Thai older adults (n = 4,130).	46

Table 14. Associations between prosthesis conditions and oral health-related quality of life in Thai older adults (n = 4,130).....	47
Table 15. Multiple logistic regression models for the associations of social backgrounds, dental service utilization (DSU), and oral status with difficulty eating among Thai older adults (n = 4,130).	49
Table 16. Multiple logistic regression models for the associations of social backgrounds, dental service utilization (DSU), chronic health conditions, and oral status with difficulty speaking among Thai older adults (n = 4,130).	51
Table 17. Multiple logistic regression models for the associations of social backgrounds, dental service utilization (DSU), chronic health conditions, and oral status with satisfaction among Thai older adults (n = 4,130).....	53



LIST OF FIGURES

Page

No table of figures entries found.



CHAPTER 1

INTRODUCTION

Nowadays, number of older adults (defined as aged 60 and over) in Thailand has increased rapidly and will continue to do so in future decades. By 2040, Thailand's aging population is expected to be around 17 million, accounting for 25 percent of the population. Common causes for increasing old population are declining fertility, advancement in medicine and better access to health services, number of baby boomers are aging. As people aged, they become more susceptible to disease and disability, due to changes in structure and function that occur with age and patterns of harmful behavior for example poor nutrition, physical inactivity, tobacco, alcohol contribute to the development of chronic conditions "non-communicable disease" (diabetes, cardiovascular diseases, cancer, chronic respiratory diseases, and mental disorders). All of these diseases can decrease quality of life of older adults.

There are many factors related to oral health-related quality of life. In older adults, there are several oral conditions such as dental decay, tooth wear, periodontitis, oral lesion, tooth loss, denture wearing, and xerostomia. The poor oral conditions have the potential to reduced oral health-related quality of life. Moreover, socioeconomic status such as low income or saving, education and social class could reduce the quality of life. Behavior such as smoking and alcohol consuming can jeopardize oral and general health.

This study therefore aims to investigate which oral conditions has more potential to reduce the quality of life. The findings will expand oral health knowledge of quality of life, and improve the treatment approaches or behavioral improvement of older adults which will be beneficial to elderly patients, researchers, and health care professionals.

CHAPTER 2

REVIEW OF LITERATURE

Many studies of older adults found that there are several factors affecting their oral health-related quality of life (OHRQoL) such as socioeconomic status, dental diseases, regular dental visits, treatment seeking behavior, impairment of normal daily activities, degree of systemic disease, and self-perceived oral health (1-7). Common oral problems in older adults are poor oral hygiene, caries, periodontal disease, xerostomia, and defective or poorly fitting dentures (8-10). Oral behavior in older adults that cause poor oral hygiene such as non-regular dental attendance, brushing and flossing infrequently, smoking and alcohol consumption. In this research we focusing in oral problems and behaviors related to oral health-related to quality of life in Thai older adults.

2.1 Health-related quality of life (HRQoL) and oral health-related quality of life (OHRQoL)

Nowadays, quality of life is defined as “a composite measure of physical, mental and social well-being as perceived by each individual or by group of individuals – that is to say, happiness, satisfaction and gratification as it is experienced in such life concerns as health, marriage, family work, financial situation, educational opportunities, self-esteem, creativity, belongingness, and trust in others” (11).

HRQoL is the individual’s perception of health which could be affected by a variety of factors; such as, healthcare systems or past experience of health (12). OHRQoL is part of quality of life that is affected by an individual’s oral health also known as a subset of HRQoL (13). In general, OHRQoL is exactly how oral health affects the individual’s ability to function, pain/discomfort, psychological states, social backgrounds, and related to oral health (14).

As a result of rapidly concerned about the impact of oral health conditions on an individual’s quality of life, variety of OHRQoL instrument have been founded (15). Frequently used questionnaires are the Oral Health Impact Profile (OHIP)(16), the Oral Impacts on Daily Performance (OIDP) (17) and the Geriatric/General Oral Health

Assessment Index (GOHAI) (18). OHIP was developed by Slade and Spencer (16). The OHIP is a questionnaire with 49 items, can be time-consuming and difficult to administer, to overcome this problem, a short form of OHIP is only 14 items extracted from the original questionnaire, OHIP-14, was derived by Slade (19). The OHIP was developed to provide a comprehensive measure of the discomfort, dysfunction, and disability according to oral conditions (20). The GOHAI was developed by Atchinson and Dolan. GOHAI is a 12-item questions originally developed for use with older adults populations, GOHAI is an example of a patient-based assessment of oral health problems commonly affecting elder people (21). It assesses the psychosocial impacts associated with oral disease and measures patient reported on oral functional problems.

A single question also can identify OHRQoL, Single-question measures known as global rating. Global rating is a current health condition. The advantage of global rating is a minimal demand on respondent's time, in contrast the brevity of question is a weak point, as the answer do not provide information about aspect of respondent's health deteriorated by the disorder or disease. However, in health services research global rating are broadly used. Global rating is great predictor of the use of health services, functional decline, and survival (22, 23). There was an evidence to suggest that global rating provide a summary of how people perceive their health, so global rating may be as useful as more complex multi item scales and indexes (24).

2.2 Tooth loss and its association with OHRQoL

Factors contributing to tooth loss among older adults are periodontal disease, unrestoreable teeth (from fractures or caries), and periapical lesions. However about 35% of the extracted teeth were previously treated tooth (25). In patients who do not visit their dentists at least once a year were likely to have periodontal progression (26). Progressive loss of attachment level in older adults were associated with tooth loss (27).

In denture wearers, there are synergistic effect between coronal root caries and removable denture lead to tooth loss in older adults. There were multiples carious lesions in denture wearers, when the lesion were treated they had the highest risk of

tooth loss (28). As well as root caries, when caries exposed to root dentine, it produced a positive relation to tooth loss (29).

Tooth loss also associated with education and income level, people with low education levels and low income are associated with higher chances of tooth loss (30). People with lower socioeconomic (i.e. income, education or occupation) status tend to have a more negative view of their oral health than their higher socioeconomic counterparts (31-34). Mostly people with low income did not visit a dentist regularly (35, 36), consumed many sugars (36), did not brush their teeth frequently (36), and smoked (35), likely to suffered more from coronal and root caries. Independent effects on progression of periodontal diseases in older adults were no dental checkups, few teeth present, low education, and regular smoking (37, 38).

People with high income were likely to seek periodontal cleaning routine and conservative treatment, reflecting in numbers of retained teeth, contrast with people who had low income that were more prone to dental extraction (39, 40). Not only tooth loss, People with low income has more oral diseases, such as periodontitis and dental caries (41), and systemic conditions such as obesity, diabetes and cardiovascular disease (42).

In Thai rural population the most significant factors contributing to tooth loss were age, smoking, chewing betel nuts, periodontitis, and dental caries (43). Tooth loss impaired quality of life (44), affecting daily activities such as chewing, swallowing, phonation, esthetics, and social life (44-46). Tooth loss may related to malnutrition, due to loss of masticatory performances. Posterior occlusal contact of the remaining dentition were key predictor of reduction in masticatory performance (47, 48).

The number and distribution of teeth influence the ease and comfort of mastication, as well as the presence of dental prostheses (49, 50). Tooth loss may lead to inappropriate of food selection. As a result, it can reduce the appetite and loss of joy in eating, which is a risk factor for malnutrition (51, 52). Tooth loss was associated with lower diet quality (53-55) higher intake of carbohydrate (56), lower intake of protein (57, 58). As tooth lost, people consumed more sugar and fat owing to these kind of food were easy to chew (58, 59).

Numerous studies showed an association between diet and edentulous (60-62). Reports from Thailand (63), Sri Lanka (64), and Korea (65) also found that many edentulous people had low body weight. Inadequate intake of fluids and food can lead to poor health, result in a decreased quality of life (66).

2.3 Prosthesis status and prosthesis need and their associations with OHRQoL

Prosthesis status is a strong predictor for impaired OHRQoL in OHIP assessment (67, 68). Individuals wearing removable partial dentures had lower OHRQoL than fully or partially dentate Individuals without removable partial dentures (68, 69). Research by John et al (68), median of OHIP-49 shown us in removable partial denture user was higher than subjects without dentures and lower than complete denture users. Celebic and Knezovic-Zlataric (70) reported that removable partial denture users were significantly less satisfied than complete denture users with their speech, but the opposite was reported for chewing. In contrast K. H. BAE (71), reported that there was no significant difference between complete denture and removable partial denture users for OHIP-49 score, there was no significant OHRQoL differences between removable partial denture and complete denture users. In general satisfaction with their dentures there was no significant difference between complete denture and removable partial denture users. Mitsuyoshi et al. reported that patients who have a greater QoL were also satisfied with their complete dentures (72).

Prosthetic treatment for edentulous patients often improves their function such as chewing and also improve their appearance, and social functioning (73, 74). Poorly fitting prosthesis affected patient's ability to eat satisfactory, talk clearly, and smile freely (75). However in some studies was not shown that prosthetic treatment enhances patients' QoL (76-78).

Nowadays, numerous researchers suggest that minimum standard of care for the edentulous mandible should be implant retained overdenture (79). Implants offer retention possibilities which may overcome some of limitations of conventional complete dentures. However, some researches have shown that edentulous patients who had receive implant retain prosthesis did not dramatically alter their diet (80, 81).

Improving the quality of prosthesis in edentulous patients was unlikely to result in significant improvement in diet (82).

Effect of prosthodontic treatment is usually clinically observed or from patient satisfaction (83, 84). Numerous studies showed that OHRQoL of edentulous persons was less good than that of dentate persons (4, 85-87). Prosthodontic treatment improves the quality of life of edentulous persons. The treatment contributes to a better appearance, improved social and functional comfort. However, if prostheses were not fit, and unstable or uncomfortable, they can be the cause of stress with a consequent impact on quality of life (21, 88).

2.4 Xerostomia and its association with OHRQoL

Factors that impair quality of life are not only tooth loss and malnutrition, dry mouth also plays a major role in OHRQoL. Saliva is important in maintaining oral health and function. Saliva plays a big role in taste perception, preparing food for mastication and for swallowing. Saliva flow protects soft tissues from dryness and ulceration by lubricating function (89).

Xerostomia is described as the “subjective impression of oral dryness” (90), based on an individual’s reported feeling of dry mouth rather than measurement of salivary flow rate (91). Hyposalivation is a symptom that has been defined as the “objective evidence of reduced salivary output” (92). Common causes of decreased salivary flow rates are dehydration, diabetes mellitus, specific diseases, medications, and head and neck radiotherapy (89, 91, 93-96).

Chronic xerostomia, is generally found in older adults, affects denture wearing, enjoyment and ingestion of food, and speech (9, 10). In people over 65 years old there are approximately 30 percent experiences this disorder (97). Xerostomia is common not only in the frail older adults, but also in the healthy older adults, because of older adults increased drug use due to their susceptibility to disease (98).

In denture wearers, saliva is critical for retention and comfort in wearing removable prosthesis (99). Salivary wetting mechanics are necessary to create adhesion, cohesion, and surface tension lead to increased retention of prosthesis, and contributes to denture wearers’ satisfaction. Lack of saliva in tissue surface can produce

denture sores due to lack of lubrication and prosthesis retention, also reduction in number of immune factors that salivary film provides. Poor retention and stability can cause social embarrassment if prosthesis dislodge during common function such as talking, chewing, and smiling. This matter could impair quality of life of denture wearer.

Fox et al. demonstrated that the question “Does your mouth feel dry when eating a meal?” was useful in identifying and predicting a serious inadequate or malfunction of the output of salivary glands (100). Xerostomia predict poorer OHRQoL (101). QoL and well-being of older adults are diminished by dry mouth (9).

2.5 Oral status, health status and their associations with OHRQoL

Oral sickness related to quality of life in older adults such as xerostomia, periodontal disease, dental caries, and orofacial pain (9, 102-104). Many studies showed that poor oral hygiene can exacerbate conditions commonly affected older adults such as cardiovascular disease, diabetes, osteoporosis, and respiratory disease (105-108).

Various studies have assessed the association between systemic diseases and oral infections (especially periodontitis) (109, 110). Although the data have not been concluded, there is some scientific evidence to support that local periodontal infection may be an independent risk factor for some diseases such as diabetes, dementia, pulmonary infections, cardiovascular disease, kidney disease, some types of cancer, erectile dysfunction, and preterm low-weight birth (111).

Relationship between periodontal disease and diabetes is well known (112). Patients with diabetes showed higher prevalence of oral disorders including sialosis, xerostomia, taste impairment, oral candidiasis, and oral lichen planus (113). Studies showed that diabetic patients are two to three times more likely to develop periodontal disease (114-119) and showed greater severity of periodontal disease (120). Self-reported twice-daily tooth brushing was less common in diabetic patients than in non-diabetic patients (121).

Oral cancer is a major threat to the health of adults and older adults in both low and high income countries. It comprises of lip, oral cavity, and pharyngeal cancer, and is the eighth most common cancer (122). Men had higher incidence and mortality

rates than in women. The prevalence of oral cancer increases with older age, and oral cancer is concerned among people over 65 year olds. Treatment of oral cancer is usually surgery, radiotherapy, and/or chemotherapy, and advances lead to reduction in mortality rate and increased number of survivors. Cancer and its treatment are responsible for major anatomical changes in oral cavity and changes of basic functions, such as speaking, chewing, and/or swallowing, considerably impaired quality of life of survivors (123). Steward BW reported that Oral cancer is more common in populations of less developed countries (124). The most essential determinant of oral cancer and premalignant lesions (125) including leukoplakia (126, 127) and use of tobacco, heavy alcohol consumption is also an important factor in relation to these conditions (127).

2.6 Dental service utilization (DSU) and its association with OHRQoL

Many studies have reported that non regular dental attenders tend to require more emergency treatment and more likely to suffer from the acute symptoms of dental disease than regular dental attenders (128-131). In Australia adults who did not attend for regular dental checkups were more likely to have more dental caries, poorer periodontal health, more tooth wear, more missing teeth, less than 21 teeth, and wear dentures more than people who usually visit for dental checkups (132). In New Zealand, problem attenders suffer to tooth loss because of dental caries more than regular attenders (133).

Negative experiences while tried to access dental care service, such as difficulty finding a provider, scheduling convenient appointments, long waiting times, taking time off work, transportation, and discriminatory treatment, may affect the willingness of patients to seek dental care (134-137).

Swedish population ages between 50 and 65 years who were annual dental attenders were less likely to suffer impaired OHRQoL than their counterparts who did not attend annually (138). Many researchers suggested that people who attended dental service only for dental problems were more likely to suffer from tooth loss, oral symptoms, and less likely to have good OHRQoL than those who attended routinely for dental checkups, even after adjusted confounding factors (6, 139, 140).

2.7 Oral behaviors and their associations with OHRQoL

Ability of older adults to maintain adequate oral hygiene might be decreased by cognitive decline, reduced hand function (141), sarcopenia (142), and loss of autonomy. Older adults had lower brushing frequency and tend to use dental services less than younger adults, and these incidences were even stronger in care-dependent and frail older adults (143-148). Gilbert reported that non regular dental attenders performed preventive behaviors, such as brushing and flossing less frequently than regular dental attenders (139).

Albandar et al. founded that current smokers of cigarettes, pipes, or cigars had high prevalence of moderate and severe periodontitis more than former smokers (149). Periodontitis is one of the factor that leading to tooth loss among older adults (25), this problem can impaired QoL (44). A longitudinal study in men from Strandberg demonstrated that heavy smoker had worsen HRQoL than non-smokers, and non-smokers lived longer and their extra year were better (150).

2.8 Social backgrounds and OHRQoL

2.8.1 Socio demographic and economic status (SDES)

OHRQoL, which describes people's perceptions about oral health, gender (21), relationship with age (19, 21, 151), and socioeconomic status indicators (21, 151) have been found, but for some studies did not found OHRQoL differences for gender (152, 153) or age (86). Age has an impacted to OHRQoL, Steele et al. reported that age and tooth loss were associated, but have independent effects on OHRQoL (154). Educational and cultural gap between dentists and patients are major factors leading to underutilization of dental care (134, 155-157).

In Thailand, wealthier older adults utilized dental care more than less wealthy older adults. In public facility, a primary health care facility (community hospital or local health center) was much concentrated with the lower socioeconomic status group, in contrast with higher-level facility (general/regional hospitals) tended to be slightly concentrated with the higher socioeconomic status group. Older adults of a high socioeconomic status were more likely to go for dental care at private facilities.

Older adults who were in lower socioeconomic status showed a significant lower rate of dental care utilization (158).

Socioeconomic status also affected to the type of treatment that older adults received. A high proportion of dental treatments in the older adults are extraction and prosthesis. The older adults who were in higher economic status seem to have more prosthetic treatment than their counterparts (159).

2.8.2 Capacity of older adults

Older adults can be categorized into three group according to psychosocial function (160).

1. The functionally independent older adults
2. The frail older adults
3. The functionally dependent older adults

People in the first group can remain independent even if they living with some chronic diseases that need continuing health care. People in the next two groups need assistance to maintained basic levels of personal care. The third group includes those people required special care at home or in institutions.

In most developing countries, social support and family structures are corroding due to a variety of factors, and frail older adults are in high disease risk (161). Functional impairment in oral health in older adults related to socioeconomic factors such as low education, low income, and weak social support (162-164). Petersen and Nörtov reported that weak family networks and inactive lifestyles were highly associated with poor dental care habits among old-age pensioners and poor oral and general health. Many studies indicated a relationship between reduced functional capacities and poorer personal oral hygiene along with declining use of dental services (164-168).

Numerous frail and care dependent older adults cannot clean their mouths and/or removable dentures themselves. Especially home care residents, for daily oral hygiene care dependent on others for example nurse assistants and nurses (169, 170). Still, oral health was often neglected and misunderstood by nurse assistants and nurses (171).

A critical inhibiting factor to achieve an acceptable level of oral hygiene was lack of oral health literacy and oral health care skills of care-staff. Another barrier to proper oral health and daily oral hygiene are Lack of prioritized of oral health care by their family or the care-staff or residents themselves (172, 173). Active older adults tend to have better oral health than dependent older adults.

2.8.3 Social welfare

Health insurance schemes providing healthcare coverage In Thailand consisted of Civil Servant Medical Benefit Scheme (CSMBS), Social Security Scheme (SSS), and Universal Coverage Scheme (UCS). CSMBS covers government employees and their parents, partner and children age below 20 years. SSS covers private sector employees excluding dependents. UCS covers the rest of population whom are not in CSMBS and SSS (159, 174-177). In Thailand older adults has been defined as a chronological age of 60 years old or older, they are entitled to two scheme CSMBS and UCS. The retired government employees or those accompanied by their child who is government employees are entitled to CSMBS, and the rest of the older adults who register at public facilities are entitled to UCS. Both of these schemes provide free dental care at government health facilities for the older adults comprised of restorations, periodontal treatments, extraction, and acrylic-based denture. For CSMBS scheme treatment such as endodontic and fixed prosthesis (crown, bridge) are included but with a limited rate of reimbursement (159, 175).

2.9 Summary

Nowadays, numerous researchers try to find and proof what factors are associated to OHRQoL in older adults. Several factors such as tooth loss, xerostomia, prosthesis status, oral cancer are proofed, but for some factors such as social welfare, socio-demographic status, oral behavior still have limitation of information. It was clear that older adults with high socioeconomic status has better access to oral health services more than older adults in lower socioeconomic status. Older adults who entitled to CSMBS coverage tend to attend more dental service and have more fixed prosthesis than older adults entitled to UCS coverage. Still we need more investigation

for what factor or scheme that could affected older adults OHRQoL. As far as I know, no study in Thailand has examined associations of social backgrounds, oral behavior, and oral health status with OHRQoL in older adults.

2.10 Research Questions

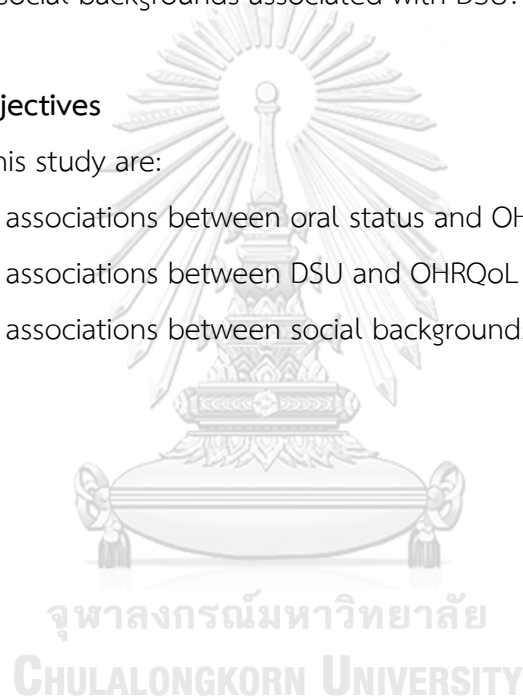
The questions of this study are:

1. What factors in oral status associated with OHRQoL in Thai Older adults?
2. Is the use of dental services related to the OHRQoL in Thai Older adults?
3. What factors in social backgrounds associated with DSU?

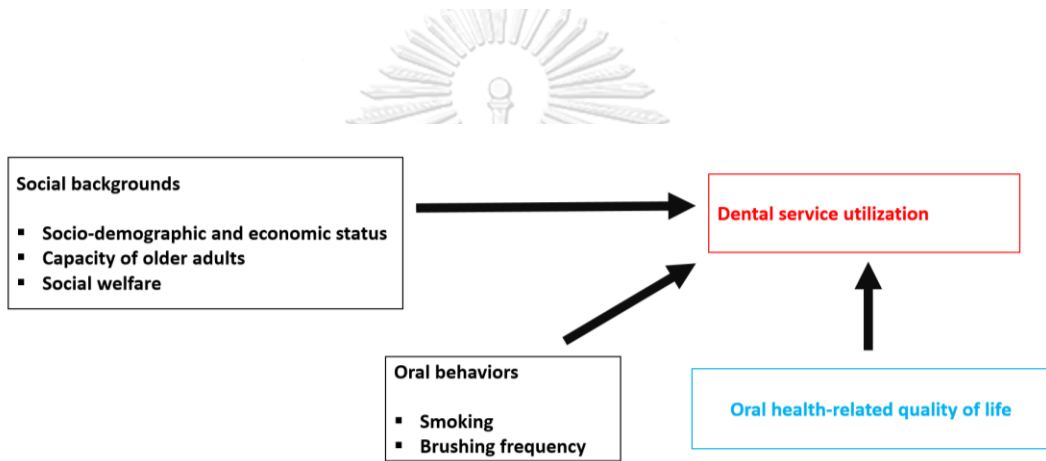
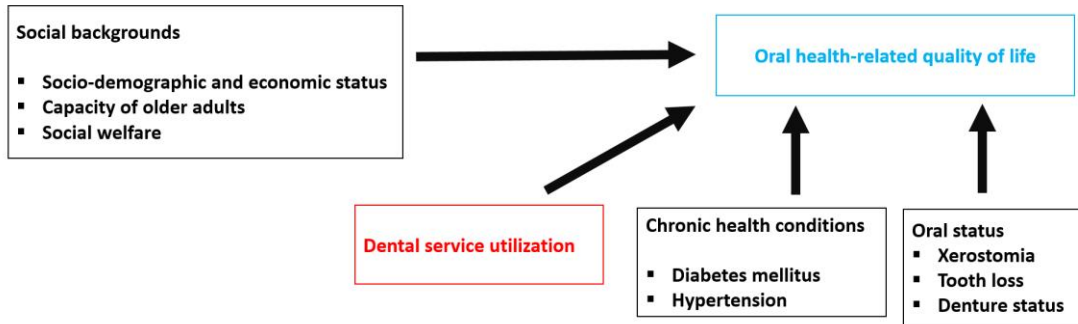
2.11 Research Objectives

The purposes of this study are:

1. To examine the associations between oral status and OHRQoL in Thai older adults
2. To examine the associations between DSU and OHRQoL in Thai older adults
3. To examine the associations between social backgrounds and DSU in Thai older adults



2.12 Research Conceptual Framework



CHAPTER 3

RESEARCH METHODOLOGY

This cross-sectional study used data from the 8th Thailand National Oral Health Survey (TNOHS) of older adults to analyze the associations of social backgrounds, oral behaviors, and oral status with oral health related quality of life (OHRQoL). This chapter explained all research methodological procedures including sampling design, data collection, and data analysis.

3.1 Sample

In terms of sample size calculation, the main objective of study was to examine social backgrounds, oral behaviors, and oral status associated with OHRQoL, and to examine social backgrounds associated with dental service utilization (DSU) among Thai older adults. Estimated proportions of older adults with good OHRQoL who had attended a dentist were used to calculate sample size in this study. Proportion of older adults with oral impact whom had missing 11-19 teeth were 64% and the estimated proportion of older adults with oral impact whom had missing more than 20 teeth were 68.5% (178). The sample size was calculated by using 80% power and 95% confidence interval level. The calculated sample size was 3,466 older adults. Moreover, this study using data from the 8th TNOHS, high response rates are expected in this study because of invalid information or inappropriate data. Over sample size by 10% would be required. However, the present study used data from the 8th TNOHS, thus the data of 4,130 older adults were used.

The subjects in the 8th TNOHS were selected using a stratified multi-stage method. Thailand was divided into 13 area health, in one area health consisted of two province, in one province consisted of four district. For Bangkok, six sub-districts were randomly selected. Samples within each selected area were randomly drawn from citizen's registry. The size of sample within each selected area was based on the proportion of municipal and rural population in that province and thus constituted an equal probability sample. The sample size was calculated by using 80% power, 95% confidence interval level, 10- 15% statistic error (relative d) and 2 design effect (deff)

(179). Design effects referred to the ratio of the variance of the estimator of complex sampling design to the variance of the estimator based on simple random sampling design. Silva & Roncalli demonstrated that in order to overcome the effects of complex cluster sampling process, minimum sample sizes of the oral health survey should multiple about two or less (180). Area of examinations were 24 province and Bangkok, random sampling by stratified three stage sampling. Sampling two province in one area health by systemic sampling. Size of sampling in each index age calculated by quota sampling. Now a day, urbanization and rural are not difference, ratio of sample size in urban and rural are 2:2, in one examination place there were about 30 people men and women were same in number.

$$n = \frac{Z_{\alpha/2}^2 P(1-P) * (deff)}{d^2}$$

Formula for calculated the sample size from the 8th TNOHS

3.2 Data collection

This study used data from ministry of public health. Data divided to 6 parts, which were social backgrounds, oral behaviors, DSU, chronic health conditions, oral status, and OHRQoL. Data were collected through oral examination and interviewed. For interviewed part, data that we used were

1) Social backgrounds

Social backgrounds including location (urban/ rural), gender (male/ female), age (60-64, 65-69 and 70-74), marital status (single, widow, divorce/ married), social welfare (universal coverage scheme, social security scheme and civil servant medical benefit scheme), income ($\leq 15,000$ baht/ $>15,000$ baht), education (primary school or less/ middle school or more), and functional capacity (stable/ decline and loss).

2) Oral behaviors

The oral behavior questionnaire was composed of questions on: (1) Brushing frequency (more than two times/less than two times per day) and (2) Smoking status (never-smoked, ex-smoker/ smoker).

3) DSU

The DSU questionnaire was composed of one question: (1) Did you use dental services during the past year? (yes/ no).

4) Chronic health conditions

Chronic health conditions, we used the history of systemic diseases which were diabetes and hypertension. The questions for chronic health conditions were “do you have diabetes” and “do you have hypertension” the answer for these questions were yes/no.

5) OHRQoL

The OHRQoL questionnaire were composed of three questions: (1) Do you have any problem for chewing the food in daily life? (no problem/ sometimes, often), (2) Do you have any problem for speaking or pronouncing in daily life? (no problem/ sometimes, often), and (3) Do you satisfy with your oral health status? (dissatisfy/ neutral, satisfy).

For oral status part, we used data from oral examination. The data that we used were

1) Oral dryness condition

Oral dryness condition measured by oral examination, using the mouth mirror to touch the buccal mucosa and tongue. If mouth mirror stucked, we defined as yes, if not we defined as no.

2) Dentition status

Number of teeth were counted from remaining teeth. If the remaining teeth need to be extracted in treatment need, those will be not counted. The total number of teeth was thirty-two.

3) Posterior occlusal pairs

Number of occlusal pairs were counted from first pre molar to third molar left and right, thus, the total numbers was ten.

4) Prosthesis status/ Prosthesis need

Prosthesis status noted type of prosthesis that older adults have (fixed or none/ removable prosthesis). Prosthesis need evaluated the space in dental arch and measured older adult’s need (no prosthesis need/ need prosthesis).

3.3 Study implementation

3.3.1 Permission

The study protocol was approved by The Human Research Ethics Committee of the Faculty of Dentistry, Chulalongkorn University, Bangkok, Thailand (HREC-DCU 2019-002). The present study used data from the 8th TNOHS, which was conducted from June—August, 2017. The data were collected using interviews and oral examinations by trained interviewers and calibrated dentists respectively.

3.3.2 Preparation of document

For the face and content validity, The standard forms for clinical oral examinations and the questionnaire was created and adjusted by experts in community oral health following the oral health survey basic method (181), considering its appropriateness to the Thai cultural context, its practicality, and time consumed during data collection. The questionnaire was tested on a group of older adults who were not the study sample to ensure that older adults understood the questions and did not feel uncomfortable answering them. The results were re-evaluated by the experts, subsequently, items that were difficult to answer or irrelevant were excluded. Oral examination tools follow World Health Organization (WHO), which were WHO Periodontal probe and plane mouth mirror, instrument cassettes, and cleaning equipment. The questionnaire and data collecting procedure were approved by the Bureau of Dental Health, Department of Health, and Ministry of Public Health of Thailand.

3.3.3 Training and calibration exercises

Training and calibration exercises were conducted after all instruments were prepared, which were.

A) Interviews, the interviewers attended a seminar and training about the survey process, the questionnaire, the appropriate way to interview individuals in this age group, and made an agreement on standard adjustment with the Bureau of Dental Health of Thailand. This method was similar to that used in the 7th TNOHS (182).

B) Oral examinations, all the examined dentists attended a seminar, training and practicing at the Bang Len hospital, Nakhonpathom province. Dentition status was measured starting at the most distance tooth on the upper right through the most distal tooth on the upper left followed by the most distal tooth on the lower left through the most distal tooth on the right. In every tooth examined from occlusal, mesial, distal, and lingual respectively. Treatment need was recorded after dentition status of each tooth. The examination resulted from the examined dentist were calibrated with others examined dentists and the experts, and made an agreement on standard adjustment, which had to be 80% agreement or more and more than .8 on kappa coefficient on standard adjustment.

3.3.4 Implementation steps

a) Questionnaires, all required data were carried out in first visit.

b) The implementation of oral examination, assessing of the oral status were done using plane mouth mirror and WHO Periodontal probe. Each examined dentists worked with trained recorder arranging duplicate examinations. Each subject lied down on a portable chair facing natural light. Examiners examined behind an older adult's head. Recorders sat close to examiner for hearing corrected data.

3.4 Data analysis

Data from eight Thailand National Oral Health Survey of 60-and 74- year old older adults were analyzed using The SPSS software package (version 22.0; SPSS, Chicago, IL, USA). The level of significant was set at 5%. Statistical analyses were include the followings:

3.4.1 Descriptive statistics

Descriptive statistics including frequency and distribution were analyzed, which were:

a) Social backgrounds (socio-demographic and economic status, capacity of older adults, social welfare), oral behaviors (brushing frequency, smoking status), DSU, chronic health conditions (diabetes mellitus, hypertension), Oral status (xerostomia, tooth loss, prosthesis status, prosthesis need). Social backgrounds, oral behaviors, DSU,

chronic health condition, and oral status will be categorical variables, with two or more ordered categories.

b) OHRQoL data (difficulty eating, difficulty speaking, dissatisfied with oral health). Outcomes of the OHRQoL were categorical variables, with two or more ordered categories.

3.4.2 Bivariate analysis

Independent variables were categorized into discrete data and were tested for relationships with dependent outcomes, which were DSU and OHRQoL. Statistical significance was indicated when P value was less than 0.2 in bivariate analysis. Relationship of categorical social backgrounds (socio-demographic and economic status, capacity of older adults, social welfare), oral behaviors (brushing frequency, smoking status) with DSU's answer were tested. Associations of categorical social backgrounds (socio-demographic and economic status, capacity of older adults, social welfare), oral behaviors (brushing frequency, smoking status), DSU, chronic health conditions (diabetes mellitus, hypertension), oral status (xerostomia, tooth loss, prosthesis status, prosthesis need) with OHRQoL's answer were tested. Chi-square test was used to find the association between independent variables and dependent outcomes.

3.4.3 Multivariate regression model

Multivariate regression were used to evaluate independent effects of several covariates after adjusting for confounders on the following dependent outcomes. The dependent variables considered categorical variable including OHRQoL and DSU were used. Logistic regression was used for presence or absence of dependent outcomes. The enter method was used in the multiple logistic regression models.

3.5 Research Hypothesis

Hypotheses of this study were to examine associations of DSU and oral status with OHRQoL, to examine the associations between DSU and oral status and to examine associations of social backgrounds with use of oral health services in Thai older adults, which were:

3.5.1 Null hypothesis: Proportions of older adults with good OHRQoL in groups with good oral status would equal to those in groups with poor oral status

Ho: $\pi_a = \pi_o$

π_a = Proportions of older adults with good OHRQoL in groups with good oral status

π_o = Proportions of older adults with good OHRQoL in groups with poor oral status

Alternative hypothesis: Proportions of older adults with good OHRQoL in groups with good oral status would not equal to those in groups with poor oral status

Ha: $\pi_a \neq \pi_o$

3.5.2 Null hypothesis: Proportions of older adults with good OHRQoL in groups with use of dental service and good oral status would equal to those in groups with unused of dental service and poor oral status

Ho: $\pi_a = \pi_o$

π_a = Proportions of older adults with good OHRQoL in groups with use of dental service and good oral status

π_o = Proportions of older adults with good OHRQoL in groups with unused of dental service and poor oral status

Alternative hypothesis: Proportions of older adults with good OHRQoL in groups with use of dental service and good oral status would not equal to those in groups with unused of dental service and poor oral status

Ha: $\pi_a \neq \pi_o$

3.5.3 Null hypothesis: Proportions of older adults with use of dental service in groups with good social backgrounds would equal to those in groups with poor social backgrounds

Ho: $\pi_a = \pi_o$

π_a = Proportions of older adults with use of dental service in groups with good social backgrounds

π_o = Proportions of older adults with use of dental service in groups with poor social backgrounds

Alternative hypothesis: Proportions of older adults with use of dental service in groups with good social backgrounds would not equal to those in groups with poor social backgrounds

Ha: $\pi_a \neq \pi_o$

3.5.4 Null hypothesis: Proportions of older adults with use of dental service in groups with functionally independent would equal to those in groups with frail and functionally dependent

Ho: $\pi_a = \pi_o$

π_a = Proportions of older adults with use of dental service in groups with functionally independent

π_o = Proportions of older adults with use of dental service in groups with frail and functionally dependent

Alternative hypothesis: Proportions of older adults with use of dental service in groups with functionally independent would not equal to those in groups with frail and functionally dependent

Ha: $\pi_a \neq \pi_o$

3.5.5 Null hypothesis: Proportions of older adults with use of dental service in groups with CSMBS would equal to those in groups with UCS

Ho: $\pi_a = \pi_o$

π_a = Proportions of older adults with use of dental service in groups with CSMBS

π_o = Proportions of older adults with use of dental service in groups with UCS

Alternative hypothesis: Proportions of older adults with use of dental service in groups with CSMBS would not equal to those in groups with UCS

Ha: $\pi_a \neq \pi_o$

CHAPTER 4

RESULTS

4.1 Descriptive results

This part presents the descriptive results of the study in relation to sample characteristics including social backgrounds, oral behaviors, dental service utilization (DSU), chronic health conditions, oral status, and oral health-related quality of life (OHRQoL).

4.1.1 Social backgrounds

A total data of 4,130 older adults were used in this study. Social backgrounds of older adults were presented in Table 1. Fifty-five percent of older adults lived in urban area. Female (51.5%) were participated slightly more than male. Nearly seventy percent of older adults were married. Older adults between 70-74 years old were most participated (36.0%). The majority of older adults entitled to USC (79.8%). Most of the older adults educated in primary school or less (78.0%) and their income were less than 15,000 (90.9%). Ninety-six percent of older adults were in stable condition.

Table 1. Distribution of social backgrounds among Thai older adults (n= 4,130).

Variables		N (%)
Location	Urban	2,242 (54.3)
	Rural	1,888 (45.7)
Gender	Male	2,001 (48.5)
	Female	2,129 (51.5)
Marital status	Single/widow/divorce	1,325 (32.1)
	Married	2,805 (67.9)
Age	60-64 yr	1,383 (33.4)
	65-69 yr	1,262 (30.6)
	70-74 yr	1,485 (36.0)
Welfare	UCS	3,294 (79.8)
	SSS	142 (3.4)
	CSMBS	694 (16.8)
Education	Primary school or less	3,222 (78.0)
	Middle school or more	908 (22.0)
Income	≤15,000 Baht	3,756 (90.9)
	>15,000 Baht	374 (9.1)
Functional capacity	Stable	3,961 (95.9)
	Decline and loss	169 (4.1)

UCS, Universal Coverage Scheme; SSS, Social Security Scheme; CSMBS, Civil Servant Medical Benefit Scheme.

4.1.2 Oral behaviors

In term of oral behaviors (Table 2), vast majority of the older adults were non-smoker or ex-smoker (86.4%). Around forty percent of the older adults brushed their teeth less than 2 times (41.5%).

Table 2. Distribution of related oral behaviors among Thai older adults (n= 4,130).

Variables		N (%)
Smoking status	Never-smoked, Ex-smoker	3,570 (86.4)
	smoker	560 (13.6)
Brushing frequency	Less than 2 times	1,712 (41.5)
	2 times or more	2,418 (58.5)

4.1.3 DSU

DSU of older adults were presented in Table 3. More than half of the older adults did not visit the dentist in the previous year (61.6%).

Table 3. Distribution of dental service utilization (DSU) among Thai older adults (n= 4,130).

Variables		N (%)
DSU	Not Utilize	2,543 (61.6)
	Utilize	1,587 (38.4)

4.1.4 Chronic health conditions

Around twenty to forty of older adults had chronic health conditions (Table 4), 21.5% were diabetes mellitus and 43.9 percent were hypertension.

Table 4. Distribution of chronic health conditions among Thai older adults (n= 4,130).

Variables		N (%)
Diabetes mellitus	No	3,244 (78.5)
	Yes	886 (21.5)
Hypertension	No	2,317 (56.1)
	Yes	1,813 (43.9)

4.1.5 Oral status

From the 4,130 older adults, 5.0 % of older adults had oral dryness problem. We assessed dry mouth by mouth mirror, if the instrument sticks to the buccal mucosa or tongue of the participants, the participants had dry mouth. More than half of older adults had less than 20 teeth (53.9%) (Table 5). Around one-third of older adults had 21-27 teeth. Only ten percent of older adults had 28 teeth or more (13.8%). Percentages of older adults whom had less than 4 occlusal units were 60.9%, nearly thirty percent had 4-7 occlusal pairs, while just about 10 percent had 8 occlusal units or more. Around half to seventy of older adults need upper prosthesis (60.8%) (Table 6), lower prosthesis (67.8), and need upper and lower prosthesis (52.8%). Percentages of older adults whom wear upper removable prosthesis, lower removable prosthesis, and upper and lower removable prosthesis were 23.0%, 17.3% and 24.8% respectively.

Table 5. Distribution of oral status among Thai older adults (n= 4,130).

Variables	N (%)
Xerostomia (mouth mirror stick)	
Yes	206 (5.0)
No	3,924 (95.0)
Number of Tooth	
< 20	2,228 (53.9)
≥ 20	1,902 (46.1)
< 22	2,482 (60.1)
≥ 22	1,648 (39.9)
< 26	3,205 (77.6)
≥ 26	925 (22.4)
< 27	3,383 (81.9)
≥ 27	747 (18.1)
< 28	3,559 (86.2)
≥ 28	571 (13.8)

Table 5. Distribution of oral status among Thai older adults (n= 4,130) (continued).

Variables	N (%)
Occlusal pairs	
< 4	2,517 (60.9)
≥ 4	1,613 (39.1)
< 6	3,141 (76.1)
≥ 6	989 (23.9)
< 7	3,470 (84.0)
≥ 7	660 (16.0)
< 8	3,705 (89.7)
≥ 8	425 (10.3)

Table 6. Distribution of prosthesis conditions among Thai older adults (n= 4,130).

Variables	N (%)
<i>Prosthesis Status</i>	
Upper	
Fixed or none	3,179 (77.0)
Removable	951 (23.0)
Lower	
Fixed or none	3,416 (82.7)
Removable	714 (17.3)
Upper and lower	
Fixed or none	3,104 (75.2)
Removable	1,026 (24.8)
<i>Prosthesis Need</i>	
Upper	
No need	1,621 (39.2)
Need	2,509 (60.8)
Lower	
No need	1,331 (32.2)
Need	2,799 (67.8)
Upper and lower	
No need	1,949 (47.2)
Need	2,181 (52.8)

4.1.6 OHRQoL

Half of the older adults had difficulty eating (52.7%), while 12.9% of older adults had difficulty speaking. Eighty-one percent of older adults satisfied with their oral health (Table 7).

Table 7. Distribution of oral health-related quality of life among Thai older adults (n= 4,130).

Variables		N (%)
Difficulty eating	No	1,952 (47.3)
	Sometimes /often	2,178 (52.7)
Difficulty speaking	No	3,599 (87.1)
	Sometimes /often	531 (12.9)
Satisfaction	Dissatisfy	760 (18.4)
	Neutral/ satisfy	3,370 (81.6)

4.2 Associations of social backgrounds, oral behaviors, and OHRQoL with DSU

In this part, the descriptive results of social backgrounds, oral behaviors OHRQoL, and DSU are compared and their associations are explored. This part reports the associations between OHRQoL and DSU adjusting for social backgrounds and oral behaviors.

The univariate analysis revealed significant associations between DSU and some social backgrounds, oral behaviors, and OHRQoL (Table 8). Older adults who lived in an urban area, were educated higher than middle school, had a high income, and were entitled to Civil Servant Medical Benefit Scheme (CSMBS) were more likely to use dental services compared with their counterparts. For oral behaviors, older adults who brushed their teeth at least 2 times per day, and were non-smokers or ex-smokers to use dental services more than their counterparts. For OHRQoL, older adults who had difficulty eating, difficulty speaking, and dissatisfied to their oral health were more likely to use dental services. However, social backgrounds of age, sex, marital status, and functional capacity were not associated with DSU (Table 8).

The multiple logistic regressions models are shown in Table 9. When Social backgrounds and oral behaviors were entered into the model (model 1), the association of brushing frequency became non-significant. Older adults whom lived in urban area, educated higher than middle school, had a high income, entitled to CSMBS and never smoked or ex-smoker were significantly more likely to utilized dental service. Further adjusting with OHRQoL (model 2.1 to model 2.3), older adults whom had difficulty eating, difficulty speaking, and dissatisfaction with their oral health were significantly more likely to utilized dental service.

Table 8. Association between social backgrounds, oral behaviors, oral health related quality of life and dental service utilization (DSU) in Thai older adults (n = 4,130).

Variables		N (%)	DSU (yes) (%)
Age	60-64 yr	1,383 (33.4)	39.6
	65-69 yr	1,262 (30.6)	36.9
	70-74 yr	1,485 (36.0)	38.7
Gender	Male	2,001 (48.5)	37.7
	Female	2,129 (51.5)	39.1
Marital status	Single/widow/divorce	1,325 (32.1)	39.2
	Married	2,805 (67.9)	38.0
Location	Urban	2,242 (54.3)	41.7
	Rural	1,888 (45.7)	34.5***
Education	Primary or less	3,222 (78.0)	36.1
	Middle school or more	908 (22.0)	46.7***
Income (Baht)	≤15,000 Baht	3,756 (90.9)	36.7
	>15,000 Baht	374 (9.1)	55.6***
Social Welfare	UCS	3,294 (79.8)	36.1
	SSS	142 (3.4)	40.8
	CSMBS	694 (16.8)	49.1***
Capacity of older adults	Stable	3,961 (95.9)	38.5
	Declining and loss	169 (4.1)	36.7
Brushing Frequency	Less than 2 times	1,712 (41.5)	35.8
	2 times or more	2,418 (58.5)	40.3**
Smoking status	Never-Smoked, Ex-Smoker	3,570 (86.4)	39.4
	Smoker	560 (13.6)	32.1**
Difficulty eating	No	1,952 (47.3)	35.0
	Sometimes /often	2,178 (52.7)	41.5***
Difficulty speaking	No	3,599 (87.1)	37.6
	Sometimes /often	531 (12.9)	43.9**
Satisfaction	Dissatisfy	760 (18.4)	43.6
	Neutral/ satisfy	3,370 (81.6)	37.3**

***P < 0.001, **P < 0.01 (Chi-square test).

UCS, Universal Coverage Scheme; SSS, Social Security Scheme; CSMBS, Civil Servant Medical Benefit Scheme.

Table 9. Multiple Logistic regression models for the association of social backgrounds, oral behaviors and oral health related quality of life with dental service utilization (DSU) among Thai older adults (n = 4,130).

		DSU			
		C)			
		Model 1 (95% CI)	Model 2.1 (95% CI)	Model 2.2 (95% CI)	Model 2.3 (95% CI)
Location	Urban	1	1	1	1
	Rural	0.74 (0.65, 0.84)***	0.75 (0.66, 0.85)***	0.74 (0.65, 0.84)***	0.74 (0.65, 0.85)***
Education	Primary school or less	1	1	1	1
	Middle school or more	1.21 (1.02, 1.43)*	1.22 (1.03, 1.45)*	1.21 (1.02, 1.44)*	1.20 (1.01, 1.43)*
Income (Baht)	≤15,000 Baht	1	1	1	1
	>15,000 Baht	1.67 (1.31, 2.14)***	1.71 (1.34, 2.19)***	1.69 (1.32, 2.16)***	1.69 (1.32, 2.16)***
Social welfare	UCS	1	1	1	1
	SSS	1.05 (0.74, 1.49)	1.05 (0.74, 1.50)	1.06 (0.74, 1.50)	1.03 (0.72, 1.47)
	CSMBS	1.31 (1.08, 1.58)**	1.32 (1.09, 1.60)**	1.31 (1.08, 1.58)**	1.31 (1.08, 1.58)**
Brushing frequency	Less than 2 times	1	1	1	1
	2 times or more	1.12 (0.99, 1.28)	1.13 (0.99, 1.29)	1.13 (0.99, 1.29)	1.13 (0.99, 1.28)
Smoking status	Never-Smoked, Ex-Smoker	1	1	1	1
	Smoker	0.75 (0.61, 0.91)**	0.74 (0.61, 0.90)**	0.74 (0.61, 0.90)**	0.74 (0.61, 0.90)**
Difficulty eating	No	-	1	-	-
	Sometimes /often	-	1.38 (1.21, 1.57)***	-	-
Difficulty speaking	No	-	-	1	-
	Sometimes /often	-	-	1.36 (1.13, 1.64)**	-
Satisfaction	Dissatisfy	-	-	-	1
	Neutral/ satisfy	-	-	-	0.76 (0.64, 0.89)**

Notes: CI, confidence interval; UCS, Universal Coverage Scheme; SSS, Social Security Scheme; CSMBS, Civil Servant Medical Benefit Scheme.

Model 1: adjusted for social backgrounds and oral behaviors; model 2: further adjusted for OHRQoL. ***P < .001, **P < .01, *P < .05.

4.3 Associations of social backgrounds, DSU, chronic health conditions, and oral status with OHRQoL

In this part, the descriptive results of social backgrounds, DSU, chronic health conditions, oral status, and OHRQoL are compared and their associations are explored. This part reports the associations between oral status and OHRQoL adjusting for social backgrounds, DSU, and chronic health conditions.

4.3.1 Associations between social backgrounds and OHRQoL

Univariate analyses revealed statistically significant associations between social backgrounds and OHRQoL (Table 10). Older adults whom 70-74 years old, entitled to UCS, had low income, and low education were significantly more likely to had difficulty eating. Older adults whom had low income and low education were also significantly more likely to have difficulty speaking. Functional capacity of older adults were significantly associated with satisfaction, older adults whom were in declining group were significantly more likely to dissatisfy with their oral health.

Table 10. Associations between social backgrounds and oral health-related quality of life in Thai older adults (n = 4,130).

Variables		N (%)	Difficulty eating	Difficulty speaking	Satisfaction
			Yes	Yes	Dissatisfied
Location	Urban	2,242 (54.3)	53.7	12.7	19.1
	Rural	1,888 (45.7)	51.6 [¶]	13.0	17.5 [¶]
Gender	Male	2,001 (48.5)	52.8	12.5	18.3
	Female	2,129 (51.5)	52.7	13.2	18.5
Age	60-64 yr	1,383 (33.4)	52.1	13.2	19.0
	65-69 yr	1,262 (30.6)	50.4	12.0	18.4
	70-74 yr	1,485 (36.0)	55.3 [*]	13.2	17.8
Welfare	UCS	3,294 (79.8)	53.9	13.4	18.2
	SSS	142 (3.4)	50.0	9.2	23.9
	CSMBS	694 (16.8)	47.6 ^{**}	11.2 [¶]	18.0
Income	≤15,000 Baht	3,756 (90.9)	53.6	13.2	18.6
	>15,000 Baht	374 (9.1)	43.6 ^{***}	9.1 [*]	16.8
Education	Primary school or less	3,222 (78.0)	54.0	13.4	18.2
	Middle school or more	908 (22.0)	48.2 ^{**}	10.9 [*]	19.2
Functional capacity	Stable	3,961 (95.9)	52.5	12.9	18.2
	Decline and loss	169 (4.1)	58.6 [¶]	11.8	24.3 [*]

***P < 0.001, **P < 0.01, *P < 0.05, [¶]P < 0.2 (Chi-square test). UCS, Universal Coverage Scheme; SSS, Social Security Scheme; CSMBS, Civil Servant Medical Benefit Scheme.

4.3.2 Associations between DSU and OHRQoL

Univariate analyses revealed statistically significant associations between DSU and OHRQoL (Table 11). Older adults whom used dental service in the previous year were significantly more likely to had difficulty eating, difficulty speaking, and dissatisfied with their oral health.

Table 11. Associations between dental service utilization (DSU) and oral health-related quality of life in Thai older adults (n = 4,130).

Variables	N (%)	Difficulty	Difficulty	Satisfaction	
		eating	speaking	Dissatisfied	
		Yes	Yes		
DSU	Not utilize	2,543 (61.6)	50.1	11.7	16.9
	Utilize	1,587 (38.4)	57.0 ^{***}	14.7 ^{**}	20.9 ^{**}

^{***}P < 0.001, ^{**}P < 0.01 (Chi-square test).

4.3.3 Associations between chronic health conditions and OHRQoL

Univariate analyses revealed statistically significant associations between chronic health conditions and OHRQoL (Table 12). Older adults whom had hypertension were significantly more likely to dissatisfy with their oral health than their counterparts.

Table 12. Associations between chronic health conditions and oral health-related quality of life in Thai older adults (n = 4,130).

Variables	N (%)	Difficulty	Difficulty	Satisfaction	
		Eating	Speaking	Dissatisfied	
		Yes	Yes		
Diabetes mellitus	No	3,244 (78.5)	52.7	13.3	17.9
	Yes	886 (21.5)	52.8	11.3 [¶]	20.2 [¶]
Hypertension	No	2,317 (56.1)	53.0	13.4	17.2
	Yes	1,813 (43.9)	52.5	12.1	19.9 [*]

^{*}P < 0.05, [¶]P < 0.2 (Chi-square test).

4.3.4 Associations between oral status and OHRQoL

Univariate analyses revealed statistically significant associations between oral status and OHRQoL (Table 13 and Table 14). Number of teeth and occlusal pairs in older adults were significantly associated with difficulty eating, older adults whom had more than 26 teeth and had more 8 occlusal pairs or more were less likely to had difficulty eating. Older adults whom had lower prosthesis or upper and lower prosthesis may be associated with difficulty eating. An oral dryness and lower prosthesis need may be associated with difficulty speaking. In term of satisfaction to oral health, upper prosthesis need and number of tooth more than 26 teeth may be associated.



Table 13. Associations between oral status and oral health-related quality of life in Thai older adults (n = 4,130).

Variables	N (%)	Difficulty eating	Difficulty speaking	Satisfaction
		Yes	Yes	Dissatisfied
Xerostomia (Mouth mirror stick)				
Yes	206 (5.0)	54.4	8.7	17.5
No	3,924 (95.0)	52.7	13.1 [¶]	18.5
Number of Tooth				
<20	2,228 (53.9)	53.6	12.4	18.0
≥20	1,902 (46.1)	51.7	13.4	18.9
<22	2,482 (60.1)	53.6	12.6	18.1
≥22	1,648 (39.9)	51.5 [¶]	13.2	18.9
<26	3,205 (77.6)	53.6	12.9	18.2
≥26	925 (22.4)	49.7*	12.5	19.2
<27	3,383 (81.9)	53.6	13.2	18.0
≥27	747 (18.1)	49.0*	11.5	20.1 [¶]
<28	3,559 (86.2)	53.6	13.0	18.0
≥28	571 (13.8)	47.3**	11.9	20.7 [¶]
Occlusal pairs				
<4	2,517 (60.9)	53.0	13.0	18.0
≥4	1,613 (39.1)	52.3	12.7	19.0
<6	3,141 (76.1)	53.3	13.1	18.2
≥6	989 (23.9)	51.0	12.0	19.1
<7	3,470 (84.0)	53.3	13.1	18.1
≥7	660 (16.0)	49.5 [¶]	11.8	19.8
<8	3,705 (89.7)	53.4	13.0	18.2
≥8	425 (10.3)	47.3*	11.5	20.0

**P < 0.01, *P < 0.05, [¶]P < 0.2 (Chi-square test).

Table 14. Associations between prosthesis conditions and oral health-related quality of life in Thai older adults (n = 4,130).

Variables		N (%)	Difficulty	Difficulty	Satisfaction
			Eating	Speaking	Dissatisfied
			Yes	Yes	
<i>Prosthesis Need</i>					
Upper	No need	1,621 (39.2)	52.1	12.3	19.9
	Need	2,509 (60.8)	53.2	13.2	17.5 [¶]
Lower	No need	1,331 (32.2)	51.6	11.8	18.3
	Need	2,799 (67.8)	53.3	13.4 [¶]	18.4
Upper and lower	No need	1,949 (47.2)	52.0	12.3	19.1
	Need	2,181 (52.8)	53.4	13.4	17.8
<i>Prosthesis Status</i>					
Upper	Fixed or none	3,179 (77.0)	52.3	12.9	18.1
	Removable	951 (23.0)	54.2	12.6	19.6
Lower	Fixed or none	3,416 (82.7)	52.3	13.0	18.1
	Removable	714 (17.3)	55.0 [¶]	12.2	19.6
Upper and lower	Fixed or none	3,104 (75.2)	52.5	12.9	18.1
	Removable	1,026 (24.8)	54.5 [¶]	12.7	19.4

[¶]P < 0.2 (Chi-square test).

4.3.5 Association between oral status and OHRQoL (difficulty eating) adjusting for social backgrounds and DSU

Multiple logistic regression models were shown in table 15. When Social backgrounds and DSU were entered into the model (model 1), the association of ages, welfare, educations became non-significant. Older adults whom were in high income group remained significantly more likely to had less difficulty eating. Furthermore, difficulty eating were significantly associated with DSU, older adults whom visited dentist in the previous year were likely to had more difficulty eating compare to their counterpart. Further adjusting with oral status (number of tooth, model 2.1 to model

2.4), older adults whom had more than 26 teeth were remained significantly less likely to had difficulty eating.

Further adjusting with oral status (occlusal pairs, model 2.5 and model 2.6), older adults whom had more than 8 occlusal pairs were remained significantly less likely to had difficulty eating. Further adjusting with oral status (prosthesis status, model 2.7 and model 2.8), the association of prosthesis status and difficulty eating were not found.



Table 15. Multiple logistic regression models for the associations of social backgrounds, dental service utilization (DSU), and oral status with difficulty eating among Thai older adults (n = 4,130).

Variable	Difficulty eating (Yes)			
	Model 1 (95% CI)	Model 2.1 (95% CI)	Model 2.2 (95% CI)	Model 2.4 (95% CI)
Location				
Urban	1	1	1	1
Rural	0.93 (0.82, 1.05)	0.93 (0.82, 1.05)	0.93 (0.82, 1.06)	0.93 (0.82, 1.06)
Age				
60-64 yr	1	1	1	1
65-69 yr	0.93 (0.80, 1.08)	0.92 (0.79, 1.08)	0.92 (0.79, 1.07)	0.92 (0.78, 1.07)
70-74 yr	1.13 (0.98, 1.32)	1.12 (0.96, 1.30)	1.11 (0.96, 1.29)	1.11 (0.95, 1.28)
Welfare				
UCS	1	1	1	1
SSS	0.92 (0.65, 1.30)	0.92 (0.65, 1.29)	0.91 (0.64, 1.28)	0.91 (0.64, 1.28)
CSMBS	0.86 (0.71, 1.04)	0.86 (0.71, 1.04)	0.86 (0.71, 1.04)	0.86 (0.71, 1.04)
Education				
Primary or less	1	1	1	1
Middle or more	0.87 (0.74, 1.03)	0.87 (0.74, 1.03)	0.87 (0.74, 1.03)	0.87 (0.74, 1.03)
Income				
≤15,000 Baht	1	1	1	1
>15,000 Baht	0.72 (0.56, 0.92)*	0.72 (0.56, 0.92)**	0.72 (0.56, 0.92)**	0.72 (0.56, 0.92)**
Functional capacity				
Stable	1	1	1	1
Declining and loss	1.27 (0.93, 1.74)	1.27 (0.93, 1.74)	1.27 (0.92, 1.74)	1.27 (0.93, 1.74)
DSU				
Not Utilized	1	1	1	1
Utilized	1.37 (1.20, 1.55)***	1.36 (1.20, 1.55)***	1.36 (1.20, 1.55)***	1.36 (1.20, 1.55)***
Number of tooth				
<22	-	1	-	-
≥22	-	0.93 (0.82, 1.06)	-	-
<26	-	-	1	-
≥26	-	-	0.87 (0.75, 1.01)	-
<27	-	-	-	1
≥27	-	-	-	0.84 (0.72, 0.99)*
<28	-	-	-	1
≥28	-	-	-	0.78 (0.65, 0.94)*

Notes: CI, confidence interval; UCS, Universal Coverage Scheme; SSS, Social Security Scheme; CSMBS, Civil Servant Medical Benefit Scheme.

Model 1: adjusted for social backgrounds and DSU; model 2: further adjusted for oral status. ***P < .001, **P < .01, *P < .05.

Table 15. Multiple logistic regression models for the associations of social backgrounds, dental service utilization (DSU), and oral status with difficulty eating among Thai older adults (n = 4,130) (continued).

Variable	Difficulty eating (Yes)				
	Model 1 (95% CI)	Model 2.5 (95% CI)	Model 2.6 (95% CI)	Model 2.7 (95% CI)	Model 2.8 (95% CI)
Location					
Urban	1	1	1	1	1
Rural	0.93 (0.82, 1.05)	0.93 (0.82, 1.06)	0.93 (0.82, 1.06)	0.93 (0.82, 1.06)	0.93 (0.82, 1.06)
Age					
60-64 yr	1	1	1	1	1
65-69 yr	0.93 (0.80, 1.08)	0.92 (0.79, 1.08)	0.92 (0.79, 1.07)	0.93 (0.79, 1.08)	0.93 (0.79, 1.08)
70-74 yr	1.13 (0.98, 1.32)	1.12 (0.96, 1.30)	1.12 (0.96, 1.30)	1.13 (0.97, 1.31)	1.13 (0.97, 1.31)
Welfare					
UCS	1	1	1	1	1
SSS	0.92 (0.65, 1.30)	0.91 (0.65, 1.29)	0.91 (0.64, 1.28)	0.92 (0.65, 1.29)	0.92 (0.65, 1.29)
CSMBS	0.86 (0.71, 1.04)	0.86 (0.71, 1.04)	0.86 (0.71, 1.04)	0.86 (0.72, 1.04)	0.86 (0.71, 1.04)
Education					
Primary or less	1	1	1	1	1
Middle or more	0.87 (0.74, 1.03)	0.87 (0.74, 1.03)	0.87 (0.74, 1.03)	0.87 (0.74, 1.03)	0.87 (0.74, 1.03)
Income					
≤15,000 Baht	1	1	1	1	1
>15,000 Baht	0.72 (0.56, 0.92)*	0.72 (0.56, 0.92)**	0.72 (0.56, 0.92)*	0.72 (0.56, 0.92)*	0.72 (0.56, 0.92)**
Functional capacity					
Stable	1	1	1	1	1
Declining and loss	1.27 (0.93, 1.74)	1.27 (0.93, 1.74)	1.27 (0.93, 1.74)	1.26 (0.92, 1.73)	1.26 (0.92, 1.73)
DSU					
Not utilized	1	1	1	1	1
Utilized	1.37 (1.20, 1.55)***	1.36 (1.20, 1.55)***	1.36 (1.20, 1.55)***	1.36 (1.20, 1.55)***	1.36 (1.20, 1.55)***
Occlusal pairs					
<7	-	1	-	-	-
≥7	-	0.87 (0.73, 1.03)	-	-	-
<8	-	-	1	-	-
≥8	-	-	0.79 (0.65, 0.97)*	-	-
Prosthesis status lower					
Fix or none	-	-	-	1	-
Removable	-	-	-	1.06 (0.90, 1.26)	-
Prosthesis status upper and lower					
Fix or none	-	-	-	-	1
Removable	-	-	-	-	1.06 (0.92, 1.23)

Notes: CI, confidence interval; UCS, Universal Coverage Scheme; SSS, Social Security Scheme; CSMBS, Civil Servant Medical Benefit Scheme.

Model 1: adjusted for social backgrounds and DSU; model 2: further adjusted for oral status. *** $P < .001$, ** $P < .01$, * $P < .05$.

4.3.6 Association between oral status and OHRQoL (difficulty speaking) adjusting for social backgrounds, chronic health conditions, and DSU

Multiple logistic regression models were shown in table 16. When Social backgrounds, chronic health conditions, and DSU were entered into the model (model 1), the association of income, education became non-significant. Older adults whom used dental service last year were likely to had more difficulty speaking compare to their counterpart. Further adjusting for oral status (model 2.1 and model 2.2), oral dryness and lower prosthesis need were not associated with difficulty speaking.

Table 16. Multiple logistic regression models for the associations of social backgrounds, dental service utilization (DSU), chronic health conditions, and oral status with difficulty speaking among Thai older adults (n = 4,130).

Variable		Difficulty Speaking (Yes)		
		Model 1 (95% CI)	Model 2.1 (95% CI)	Model 2.2 (95% CI)
Income	≤15,000	1	1	1
	>15,000	0.69 (0.46, 1.04)	0.69 (0.46, 1.05)	0.69 (0.46, 1.04)
Welfare	UCS	1	1	1
	SSS	0.71 (0.39, 1.27)	0.70 (0.39, 1.27)	0.70 (0.39, 1.27)
	CSMBS	0.93 (0.70, 1.23)	0.92 (0.69, 1.23)	0.92 (0.69, 1.23)
Education	Primary or less	1	1	1
	Middle or more	0.86 (0.66, 1.11)	0.86 (0.66, 1.11)	0.86 (0.66, 1.11)
Diabetes mellitus	No	1	1	1
	Yes	0.79 (0.63, 1.00)	0.79 (0.62, 1.00)	0.79 (0.62, 1.00)
DSU	Not utilized	1	1	1
	Utilized	1.37 (1.13, 1.65)**	1.37 (1.13, 1.65)**	1.37 (1.13, 1.65)**
Mouth mirror stick	No	-	1	-
	Yes	-	0.63 (0.38, 1.03)	-
Prosthesis need lower	No need	-	-	1
	Need	-	-	1.16 (0.95, 1.42)

Notes: CI, confidence interval; UCS, Universal Coverage Scheme; SSS, Social Security Scheme; CSMBS, Civil Servant Medical Benefit Scheme. Model 1: adjusted for social backgrounds, chronic health conditions and DSU; model 2: further adjusted for oral status. ** $P < .01$.

4.3.7 Association between oral status and OHRQoL (dissatisfaction) adjusting for social backgrounds, chronic health conditions, and DSU

Multiple logistic regression models were shown in table 17. When Social backgrounds, chronic health conditions, and DSU were entered into the model (model 1), the association of functional capacity remained significant. Older adults whom were in declining and loss group remained less likely to dissatisfied with their oral health. Furthermore, dissatisfied with oral health were significantly associated with DSU, older adults whom visited dentist in the previous year were likely to dissatisfied with their oral health more than their counterpart. However, after further adjusting for oral status (model 2.1 to model 2.3), when entered prosthesis need upper into the model (model 2.3) functional capacity became non-significant.



Table 17. Multiple logistic regression models for the associations of social backgrounds, dental service utilization (DSU), chronic health conditions, and oral status with satisfaction among Thai older adults (n = 4,130).

Variable	Dissatisfied			
	Model 1 (95% CI)	Model 2.1 (95% CI)	Model 2.2 (95% CI)	Model 2.3 (95% CI)
Location				
Urban	1	1	1	1
Rural	0.91 (0.77, 1.07)	0.91 (0.77, 1.06)	0.91 (0.77, 1.06)	0.92 (0.78, 1.08)
Functional capacity				
Stable	1	1	1	1
Declining and loss	1.44 (1.01, 2.08)*	1.44 (1.01, 2.07)*	1.45 (1.01, 2.08)*	1.43 (0.99, 2.06)
Diabetes mellitus				
No	1	1	1	1
Yes	1.06 (0.87, 1.30)	1.07 (0.87, 1.30)	1.07 (0.87, 1.30)	1.07 (0.88, 1.30)
Hypertension				
No	1	1	1	1
Yes	1.15 (0.98, 1.36)	1.15 (0.98, 1.36)	1.15 (0.98, 1.36)	1.15 (0.97, 1.36)
DSU				
Not utilized	1	1	1	1
Utilized	1.27 (1.08, 1.49)**	1.27 (1.08, 1.50)**	1.27 (1.08, 1.50)**	1.27 (1.08, 1.49)**
Number of tooth				
<27	-	1	-	-
≥27	-	1.16 (0.95, 1.41)	-	-
<28	-	-	1	-
≥28	-	-	1.19 (0.96, 1.49)	-
Prosthesis Need Upper				
No need	-	-	-	1
Need	-	-	-	0.86 (0.73, 1.01)

Notes: CI, confidence interval. Model 1: adjusted for social backgrounds, chronic health conditions and DSU; model 2: further adjusted for oral status. **P < .01, *P < .05

CHAPTER 5

DISCUSSION AND CONCLUSION

The main objectives of this study were to explore the associations between oral status and oral health related quality of life (OHRQoL) adjusting for social backgrounds, dental service utilization (DSU), and chronic health conditions. In addition, this study also provide the associations between social backgrounds, oral behaviors, OHRQoL, and DSU among Thai older adults.

5.1 Associations between social backgrounds, oral behaviors, OHRQoL, and DSU

The present study investigated the association between social backgrounds, oral behaviors, OHRQoL, and oral health care utilization by older Thai adults from the latest national data. Our study indicated that socioeconomic status, social welfare, smoking behavior, and OHRQoL were associated with DSU. Older adults who lived in an urban area, had an income over 15,001 Baht, graduated middle school or more, entitled to civil servant medical benefit scheme (CSMBS), and were ex-smokers or never-smoked, had difficulty eating, difficulty speaking, and dissatisfaction with their oral health were more likely to visit a dental clinic.

As expected, socioeconomic status was positively associated with DSU; this study found that older adults who had a higher income utilized dental services more than those who had a low income. This is likely because dental treatment is typically optional, and after retiring, older adults often have less or no income. Thus, if a dental illness does not cause any difficulty in their daily life, they would not utilize dental services. This finding was consistent with those of a previous study investigating the association between socioeconomic status, social welfare, and DSU among Thai older adults. Somkotra demonstrated that wealthier older adults were more likely to use dental services in the past 12 months compared with their counterparts (158). Moreover, our study found that education level was associated with utilizing dental services among older adults. More education could indicate having higher health literacy; older adults with higher health literacy likely understand that their oral health is related to their general health (183). This finding was consistent with an earlier study.

Lo et al. reported that education level was significantly associated with DSU among southern Chinese older adults (184). The present study indicated that older adults who live in urban areas utilized dental services more than those in rural areas. There are more dentists in urban areas compared with rural areas (185), and there is also a lack of transportation for older adults in rural areas (186). This finding is comparable to a previous study showing an association between DSU and living area among older adults in China (187). Wu reported that DSU in older adults was associated with place of residence, older adults who lived in urban areas were 2.2-fold more likely to receive oral care in the past 12 months compared with older adults who lived in rural areas (187).

In addition to socioeconomic status, our study found that older adults entitled to CSMBS used dental services the most. The reason behind this finding might be that the CSMBS provides more dental treatment options. This finding was consistent with a previous study investigating the association between insurance schemes in Thai older adults and dental care utilization. Somkotra reported that older adults entitled to CSMBS were more likely to use dental services (158). A previous study reported an association between age and DSU rate; however, the present study did not find an association between age and DSU (188). This may be due to differences in subject age, the range of our subjects' age was 60–74 years old, whereas the other study used 70 years and above. A study from southern China reported an association between sex and DSU, however, the present study did not find an association (184). The differences in findings may be due to the number of participants between studies, the number of participants in our study was more than three-fold that of the previous study. Although numerous reports suggested that marital status is associated with DSU, the present study did not find this association (189, 190). The dissimilar findings in our study might be due to the different number of participants, age range, and question concerning their last dental visit, Burr and Lee asked “did not visit a dentist in the past 2 years” however, our study used the last year (189). The number of participants in Lau and Kirby (190) was 2-fold larger than ours and the age range was higher; their study age group was 65 to more than 80, however, in our study the range was 60–74. The present study did not find an association between functional capacity and DSU, which

contrasted with other studies. The disparate finding in our study might be due to the small numbers of declining and frail older adults, therefore, the association between older adults' capacity and using dental services might be weak (165, 191).

This study confirmed that smoking was significantly associated with a reduced probability of using dental services (192, 193). Slack-Smith and Hyndman found that those who currently smoked were significantly less likely to use oral health services in the previous year compared with those who were ex-smokers or never smoked (192). Osterberg et al. demonstrated that among older adults in a Swedish population who reported not visiting a dentist in the past year, lifestyle factors such as smoking was a significant risk indicator (193). Sakki et al. reported that unhealthy lifestyle behavior, such as smoking, was associated with poor dental health behavior, e.g. adding more sugar in their coffee, longer time between their last dental visit, less tooth brushing, and less use of additional tooth cleaning methods (194). Smokers are less likely to use dental services compared with non-smokers, and less likely to be concerned about their own health (194). Moreover, our study showed that among older adults, smokers were the group that utilized dental service the least, the percentage of smokers utilizing dental services was only 32.1%. This suggests that the overall attitudes of smokers towards their own health may be the underlying cause of their low dental service use.

This study found that OHRQoL was significantly associated with DSU. Older adults whom had difficulty eating, difficulty speaking, and dissatisfaction with their oral health were associated with utilization of dental service in the previous year. However, this finding was inconsistent with the previous studies (153, 188). The previous study from Thailand demonstrated that older adults whom had attended the dentist were more likely to have no oral impacts (153). The difference in our finding might come from the measurement method to defined OHRQoL and number of dental attenders. The previous study used oral impact on daily performances (OIDP) index, which was multi-item questions, while our study use global rating. Moreover, there were two cut-off points in the previous study, the first was at percentile 55 (OIDP score = 8) and the second cut-off point was at percentile 82 (OIDP score = 16). The participants was divided in 4 groups which were, zero impacts (OIDP score = 0), low impacts (OIDP score

= 0.1-7.9), moderate impacts (OIDP score = 8.0-15.9), and high impacts (OIDP score > 16), approximately seventy seven percent of attenders were in zero and low impacts groups, contrast with this present study, there was no cut-off point due to the measurement to defined OHRQoL, our study used global rating and the answer was no problem and sometimes or often, thus, even the slightest impact we defined as had impact. In addition, the number of dental attenders, older adults in this study utilized dental service around 38 percent while the dental attenders of the earlier study were seventy-six percent, two times larger compare to our study. An earlier study from Japan could not find the association between OHRQoL by ODIP index and utilization of dental service in the previous year (188). The differences between our findings might come from duration of education, physical function, activity of daily living, and measurement of OHRQoL. The participants in the previous study whom had education longer than 18 years were fifty-six percent while only twenty two percent of participants in this study educated more than middle school. The participants whom in moderate to low physical function were 36.9% and in restricted activity of daily living were fifty percent while participants whom were in decline and loss group of this study was only four percent. Moreover, the previous study used multi-item questionnaires while this study used single question, however, the earlier study did not show their OIDP's cut-off point.

Our study found that after adjusting for confounding factors, the brushing frequency in older adults was not significantly associated with using dental services. This finding was inconsistent with a previous study. Gilbert et al. (139) found that routine dental attenders brushed their teeth more than once a day; however, confounding factors were not included in their study. The difference between findings may be due to different analysis methods, our study used multiple logistic regression in contrast with Gilbert et al. (139) who used chi-square of fisher's exact test.

To increase the utilization rate of dental services among older adults, policymakers should increase the number of dental care providers and make transportation more available for older adults in rural areas, such as enhancing the efficiency of primary care units by having a dentist on duty or providing free transportation for older adults. Health providers should promote more oral health

literacy, preventive behavior, and smoking cessation. Lastly, policymakers should consider adding additional benefits to the available health insurance schemes.

5.2 Associations of social backgrounds, DSU, chronic health conditions, and oral status with OHRQoL.

The study provided the evidence on the association of social backgrounds, DSU, chronic health conditions, and oral status with OHRQoL. Our study divided OHRQoL in three domains, the first domain was difficulty eating, second was difficulty speaking, and lastly dissatisfaction with oral health. For the first domain, our study found that social backgrounds, DSU and oral status were associated with difficulty eating. Older adults who had an income over 15,001 Baht, did not visit dentist in the last 12 months, had at least 27 teeth, and had more than 8 occlusal pairs were less likely to have difficulty eating in final model.

As expected, socioeconomic status was positively associated with difficulty eating; this study found that older adults who had a higher income had less difficulty eating compare to their counterpart. This is likely because dental treatment is typically optional, and after retiring, older adults often have less or no income. People in low income group often visit dentist for extraction, not other treatment. Because of their low income they usually not have prosthesis treatment and effect to their eating efficiency, contrast to the counterpart. People in high income group have more treatment to preserve their tooth from extraction in example periodontal care, operative treatment and root canal treatment. A previous study from Australia shown that retention of teeth, number of occluding pairs and the location of remained teeth are associated with better OHRQoL (195). Even though all the teeth had been removed, the upper part will looking for fixed prosthesis treatment including dental implant and implant overdentures. Oh et al. (196) demonstrated that among edentulous patients, patients whom received implant support overdentures had better OHRQoL compare to those who not receive implant.

This finding was consistent with a previous study (197). Yiengprugsawan et al. demonstrated that the adults whom had income less than 10,000 baht had chewing difficulty more than their counterparts (197), however, the previous study divided

income in four groups which were, less than 3,000 baht, 3,001-7,000 baht, 7,001-10,000 baht, and more than 10,000 baht, contrast to our study, this current study divided income in two groups the first group was equal or less than 15,000 baht and the other was more than 15,000 baht, dissimilar between the studies income showed us even the income was set higher the results were similar. Although the previous study participants age were 15 to 87 years old, more than fifty-percent were 15-29 years old and only 2.5 percent were over 50 years old, conversely, our study participants were 60-74 years old. Regarding difference in participants' age, the association between socioeconomic status and OHRQoL still exist.

A previous study reported an association between age, education, and chewing difficulty (197), however, the present study did not find an association between age, education, and difficulty eating. This may be due to differences in subject age, the range of our subjects' age was 60–74 years old, whereas the other study used 15-87 years old, also, the education, in previous study education was divided in 3 groups, high school or less, diploma, and university degree (197), while this study used primary school or less and middle school or more. Moreover, a study from Germany reported an association between residential area and OHRQoL (68), however, the present study did not find an association. The differences in findings may be due to OHRQoL assessment. Our study used one single question, contrast to other that use OHIP-G 53 assessment. Our study question was “Do you have any problem for chewing the food in daily life” and the answer were no problem, sometimes and often. The OHIP-G 53 had 7 domains, 53 questions, the answers were made on Likert-type scale (0-5; 0 were never, 5 were very often) and sum of all the answers in every domain were analyzed. The OHIP-G will provide more information about aspect of subject's health deteriorated by the disorder or disease, however the single question were more specific to the problem and minimal demand on respondent's time.

In addition to socioeconomic status, previous study found that self-perceived general health was associated with chewing ability (198). Their participants consisted of 1,196 dentate people whom were older than fifty-five years old. To measure difficulty eating, dissatisfaction chewing ability question were used. The older adults who perceive their general health as good or better had lower risk of dissatisfy chewing

ability. However, this present study did not find an association between functional capacity and difficulty eating. The possible explanation might be from the small numbers of declining and frail older adults in this study. According to the previous study, their participants whom were in fair or less self-perceive general health were seventy-eight percent, while our study participants whom were in declining and frail condition were only four percent; consequently, the association between older adults' functional capacity and difficulty eating in this study might be weak. Moreover, a previous cross-sectional study from USA found an association between poor self-rated health with OHRQoL in older adults with disability (199). The earlier study participants were six hundred forty one disabled older adults whom were 65 years or more, their OHRQoL were assessed by OHIP-14 and found that the older adults with poor self-rated health were associated with poor OHRQoL (199).

This study could not find an association between social welfare and difficulty eating. Our finding on social welfare were inconsistent with the previous studies (200). The previous study's participants were three hundred and seventy seven people whom were in novel welfare dental program. They demonstrated that after the participants received dental treatment, seventy-nine percent show improvement in their OHRQoL, and worse baseline OHIP-14 were significantly associated with OHIP-14 score improvement. The dissimilar between these studies may be due to differences of social welfare, our study divided social welfare in three groups which were CSMB, Social Security Scheme and Universal Coverage Scheme and the participants in each group received different benefits, while others study's participants went through the same benefits. Furthermore, the earlier study compared the OHRQoL scores before and after treatment, contrast to our study, this study compared the OHRQoL between each groups.

For the association between DSU and difficulty eating, we found that older adults who utilized dental service were associated with higher difficulty eating. This finding was comparable to the earlier study in Canada. The earlier study demonstrated that dental problems was associated with DSU (201). There were 1,537 Chinese Canadians, whom were fifty-five years and older participated in this study. The study showed that among older adults Chinese immigrants in Canada, fifty-two percent of

the study participant's did not use dental service in the previous year and nearly forty-one percent have dental problem. The study found that the immigrants whom had dental problems were more likely to increase the probability of dental service use. In contrast, a previous study reported that non-regular dental attenders were associated with poor OHRQoL (140). The earlier study was a continuing longitudinal study of 1,037 babies born in New Zealand and data were collected at ages 15, 18, 26, and 32 years. OHRQoL was measured by OHIP-14 and Self-rated oral health was measured by asking participants to rate their oral health in comparison with other persons their age. The non-regular dental attenders were approximately sixty percent, related with higher OHIP-14 scores, and lower self-rated oral health score. The dissimilar in our finding with previous study might come from difference of study design. Their studies were longitudinal study (140), while our study was cross sectional study, provided the information at the point of time. Thus, this study could not show the cause and effect relationship between DSU and difficulty eating. In order to better understand, additional longitudinal studies are required (202).

This study found that older adults whom had more than 26 teeth, or had more than 7 occlusal pairs were more likely to have less difficulty eating. The reason behind this finding might be that more number of the tooth and occlusal units, the better distribution and better mastication. This finding is comparable to a previous study showing an association between tooth loss and OHRQoL (44). A systemic review from Gerritsen et al. revealed that tooth loss is associated with impairment of OHRQoL, tooth loss and their distribution affect the severity of impairment. A previous study from Norway demonstrated that more missing tooth was associated with poor OHRQoL using OIDP index (203). The odd ratio of those individuals who had missing 1–4 teeth, 5–10 teeth, and > 10 teeth were 1.4, 1.6 and 3.4 compared to those who retained all 32 natural teeth respectively. However, the age ranged in the earlier study were much wider compare to this study, their age ranged was 16-79 years old while this study was 60-74 years old. Another study from Norway used 28 natural teeth as a cut-off points (204), these cut-off points were based on study demonstrated that the OIDP increases rapidly for Norwegian people with fewer than 28 natural teeth (203). However our findings were inconsistent with the goal of ministry of public health of Thailand, the

World Health Organization (WHO), and the World dental federation (FDI). The ministry of public health has proposed a goal of the older adults to have at least 20 natural teeth and 4 occlusal units (205), WHO recommended older people should have at least 20 natural teeth (206), and FDI suggested that older adults aged 65 years and above should have 21 or more teeth (207). According to our findings, the goal to have at least 20 teeth and 4 occlusal units might not be enough, in order to enhance the OHRQoL of older people. Thus, the goal of Ministry of public health, WHO, and FDI should be higher. According to our result, we suggested, policy maker should increase more preventive plan for number of teeth and posterior teeth in the young and working aged people especially in the low income group. Regarding to WHO priority action areas (208), we should promote more effective use of fluoride, tobacco prevention, Oral health of children and youth through health promoting schools, Oral health, general health and quality of life and oral health system. Health public policies, legislation, regulation, and fiscal measures can all be utilized to promote oral health either at local, or national level. For example, encourage tighter legislation on food labelling and food claims on products, support removal of VAT and other taxes on fluoride toothpastes and toothbrushes (209).

In addition, the current study could not find an association between prosthesis status with difficulty eating. This finding was inconsistent with a previous study (210). John et al. reported that patients treated with removable prosthodontic had poorer OHRQoL than patients treated with fixed prosthodontic. This may be due to differences in subjects' age. The age range of subject in current study was 60-74, whereas other study was 24-82 years old. Another study from Germany demonstrated that prosthesis status was significantly associated with OHRQoL (68), this previous study reported that the participants with removable denture were more likely to have oral impacts compare to those without dentures. The participants with removable partial dentures and with complete dentures had 7.5 and 18.5 higher OHIP-G median score, respectively, when compare to those without removable denture. However, our study could not find that association. Possible reason might related to the difference in participants age, participants in previous study whom more than 60 years old were less than 20%, contrast to our study. The reasonable explanation could be related to the

capability of individual's adaptation. The transition from a dentate status to a wearer of removable partial prosthesis can impact more on the perception of patient than the transition from a wearer of removable partial prosthesis to a wearer of complete denture (211). This transition normally happens at older ages, when people are more resilient (212). Furthermore, a previous study reported that increasing age was associated with better mean OHRQoL score, the older adults whom were 70 years and older show better OHIP score than those below 49 years old (154).

Although numerous reports suggested that prosthesis need is associated with OHRQoL (213, 214), the present study did not find this association. The previous study from Brazil demonstrated that of all the participant, those need prosthesis regardless of already using prosthesis and those need a greater number of teeth to be replaced and those presented lost on anterior and posterior teeth had higher impact on OHRQoL (213). The dissimilar findings in our study might be due to the different number of participants, age range and education, Azevedo et al. participants were four times larger than ours and the age range were combined between adults (35-44 years) and older adults (65-74 years), however, our participants was only older adults (60-74 years). The earlier study from India found that about sixty percent of participants were in need of prosthesis and prosthesis need is significantly associated with various components of OHRQoL and physical pain was the most affected. The number of participants in Joseph et al. (214) was 8-times smaller than ours, the age range was higher; their study aged group was 60-99, however, in our study the range was 60-74 and the participants education in their study had primary education around thirty-five percent, while our study had primary education nearly eighty percent.

Another possible explanation for these differences might from precision of OHRQoL evaluation. For example, General oral health assessment index (GOHAI) has 12 questions, 6 answers per question (21), Oral health impact profile-49 (OHIP-49) has 49 questions, 5 answers per question (17), Oral health impact profile-14 (OHIP-14) has 14 questions, 5 answers per question (19, 215), and Oral impact on daily performances (OIDP) has 8 questions, including frequency and severity score (216), contrast to ours. Our study instrument used single item global rating to identify the OHRQoL, there were three choices to answer the question. Furthermore, as we mention earlier in this study,

we divided OHRQoL in three parts which were difficulty eating, difficulty speaking, and dissatisfaction with oral health, and analyzed each of those questions separately. In contrast to other instrument, they calculated score in every domain and analyzed.

It could be seen that OHRQoL of older adults was impacted by difficulty eating, the previous study reported that of all OHRQoL question symptom “uncomfortable to eat” were the most commonly report in independently-living older adults whom were 60 years and older (217).

The second domain, our study showed that DSU was the only factor that associated with difficulty speaking. Older adults whom used dental service in the previous year, were more likely to had difficulty speaking than their counterparts. A previous study in Israel reported that dental attendance was associated with physical disability (218), routine dental attenders had lower OHIP-14 scores. Previous research demonstrated that dental visit pattern was associated with difficulty speaking in OIDP domain (219), problem dental attender had greater impacts more than regular check-up patients.

This study supported previous study on the association between income and education with difficulty speaking. A previous study in Thailand reported that there were no association between incomes and education with difficulty speaking (197). Although a previous report suggested that welfare was associated with difficulty speaking, the present study did not find this association (200). The dissimilar findings in our study might be due to the number of participants and age range, a previous study participant’s age was 21 years old and above, however our study was 60-74 years old and the number of participants in our study was ten times larger than the previous one. This study could not find an association between diabetes mellitus and difficulty speaking. This finding contradicted to our expectation, most of the older adults whose age above sixty consume several medicines this could lead to dry mouth problem and diminished the quality of life of the elder. However, this finding was comparable with a previous study (220).

Our finding on dry mouth were inconsistent with the previous studies (9, 101). This may be due to differences method to define dry mouth and the method to

analyze. Locker asked 7 questions about dry mouth in the past 4 weeks, while this current study used oral examination to check dry mouth. Our study identified dry mouth by mouth mirror, if mouth mirror sticks to buccal mucosa or tongue, we indicated that this participant had dry mouth. This method to define dry mouth was similar to other dry mouth screening instrument (221). Furthermore, the current study was cross-sectional, while a study from Japan was longitudinal, thus, we were not able to determine changes in OHRQoL over time. A study from Brazil reported an association between prosthesis need and difficulty speaking (213), conversely to our study. The dissimilar findings in our study might be due to the number of participants and participant's age, Azevedo et al. study's participants were 35-44 and 65-74 years old, however, our study was 60-74 years old (213).

Lastly, for oral health satisfaction, this study found that functional capacity and DSU were associated with satisfaction in oral health among older adults. As expected, this study found that older adults who were in frail or decline condition were dissatisfied with their oral health more than those in stable condition. This finding supported previous study on the association between functional status and OHRQoL. A previous study reported that poor self-rated health and poor cognitive function were associated with poor OHRQoL (199). However, after further adjustment with upper prosthesis need, there was no association between functional capacity and dissatisfaction with oral health. Moreover, our study found that Thai older adults who utilized dental service were associated with dissatisfaction to their oral health. This is likely because dental treatment is an optional, and after retiring, older adults often have less or no income. Thus, if a dental sickness does not cause any difficulty in their life, they would not utilize dental services.

This study could not find an association between residential area and OHRQoL, our finding is comparable to a previous study in Thailand, the previous study also could not find an association between residential areas with OHRQoL (197). However, a previous study from the United States of America reported an association between residential area and OHRQoL (222), contrast to our study. The dissimilar findings in our study might be due to study design, and participants' age, a previous study was

longitudinal and participant's age was 45 years old and above, however our study was cross sectional study and our participants' age were 60-74 years old. This study could not find an association between systemic diseases and OHRQoL. Diabetes mellitus were not associated with dissatisfied with oral health. This finding was consistent with the previous study (220). Allen et al. demonstrated overall OHRQoL was not associated with diabetes, however for the domain of food choice and satisfaction with diet the OHRQoL was affected (220).

Dissimilar to a previous study, this study could not find an association between numbers of tooth and dissatisfied with oral health, this may be due to a different in participant age groups, the previous study's participants whom were more than 50 years old only 2.5%, while our participants age between 60-74 years (197). A study from Brazil reported an association between prosthesis need and oral health satisfied, conversely to our study (213). The difference between findings may be due to number of participants. The number of participants in Azevedo et al. (213) study was 4-times larger than ours.

An important limitation of this study was the choices of OHRQoL question, there were only three choices per question. Another limitation of this study was that it was cross-sectional study, thus, we were not able to determine changes in OHRQoL over time. Additional longitudinal studies and time-series data are required to test the validity of these factors. Another limitation of the current study was the questions used in the questionnaires. This study used secondary data from the 8th TNOHS, thus, the questions were limited to the questions from the survey.

There are also several strengths to this study; it was conducted on a national scale with over 4,000 Thai older adults representing the Thai older adult population well in terms of social backgrounds and oral behaviors. Moreover, due to the large number of subjects in this study the power was approximately 90%; higher power decreases the possibility of a type II error. The standardized data collection method in this study was created and adjusted by experts in community oral health according to the oral health survey basic method. The questionnaires were tested and re-evaluated by these experts and was approved by the Bureau of Dental Health, the interviewers

and examiners received calibration training, and made an agreement on standard adjustment by the Bureau of Dental Health. Finally, we analyzed our results using multiple logistic regression, adjusting for social backgrounds, and oral behaviors with dental service utilization. This method avoids confounding effects during the analysis and allows multiple comparisons simultaneously.



5.3 Conclusion

1. Thai older adults with poor social backgrounds including, location, income, education, entitled to universal coverage scheme, and smoking utilized less dental service.

2. Difficulty eating was associated with number of teeth and posterior occlusal pairs. Thai older adults who had 27 teeth or more and 8 posterior occlusal pairs or more were more likely to have less difficulty eating than their counterparts, while association between prosthesis status and difficulty eating were not found after adjusting for confounders.

3. Difficulty speaking and satisfaction with oral health were not associated with oral status, including number of teeth, number of occlusal pair units, oral dryness, prosthesis status and prosthesis need.

4. DSU was associated with OHRQoL in 3 domains. Thai older adults who utilized dental service had difficulty eating, difficulty speaking, and dissatisfaction with their oral health more than their counterparts.

5. Off all social backgrounds, income was associated with difficulty eating. Thai older adults having income more than fifteen thousand baht had less difficulty eating than their counterparts.

REFERENCES

1. Sarment DP, Antonucci TC. Oral health-related quality of life and older adults. *Oral health related quality of life*. 2002;99-109.
2. McMillan A, Wong M, Lo E, Allen P. The impact of oral disease among the institutionalized and non-institutionalized elderly in Hong Kong. *Journal of oral rehabilitation*. 2003;30(1):46-54.
3. Hunt RJ, Slade GD, Strauss RP. Differences between racial groups in the impact of oral disorders among older adults in North Carolina. *Journal of public health dentistry*. 1995;55(4):205-9.
4. Slade G, Spencer A, Locker D, Hunt R, Strauss R, Beck J. Variations in the social impact of oral conditions among older adults in South Australia, Ontario, and North Carolina. *Journal of dental research*. 1996;75(7):1439-50.
5. McGrath C, Bedi R. A study of the impact of oral health on the quality of life of older people in the UK-findings from a National Survey. *Gerodontology*. 1998;15(2):93-8.
6. Mc Grath C, Bedi R. Public dental health: Can dental attendance improve quality of life? *British dental journal*. 2001;190(5):262.
7. Locker D, Slade G. Oral health and the quality of life among older adults: the oral health impact profile. *Journal (Canadian Dental Association)*. 1993;59(10):830-3, 7-8, 44.
8. Coleman P. Improving oral health care for the frail elderly: a review of widespread problems and best practices. *Geriatric Nursing*. 2002;23(4):189-98.
9. Locker D. Dental status, xerostomia and the oral health-related quality of life of an elderly institutionalized population. *Special Care in Dentistry*. 2003;23(3):86-93.
10. Cassolato SF, Turnbull RS. Xerostomia: clinical aspects and treatment. *Gerodontology*. 2003;20(2):64-77.
11. Park K. Concept of health and disease. *Park's Textbook of Preventive and Social Medicine*. 2007.
12. Hassel AJ, Rolko C, Koke U, Leisen J, Rammelsberg P. A German version of the GOHAI. *Community dentistry and oral epidemiology*. 2008;36(1):34-42.

13. John M, Hujoel P, Miglioretti D, LeResche L, Koepsell T, Micheelis W. Dimensions of oral-health-related quality of life. *Journal of dental research*. 2004;83(12):956-60.
14. Ingelehart M, Bagramian R. Oral health-related quality of life: an introduction. *Oral health-related quality of life*. 2002:1-6.
15. Wong MC, Lo EC, McMillan AS. Validation of a Chinese version of the oral health impact profile (OHIP). *Community dentistry and oral epidemiology*. 2002;30(6):423-30.
16. Awad M, Locker D, Korner-Bitensky N, Feine J. Measuring the effect of intra-oral implant rehabilitation on health-related quality of life in a randomized controlled clinical trial. *Journal of dental research*. 2000;79(9):1659-63.
17. Slade GD, Spencer AJ. Development and evaluation of the oral health impact profile. *Community dental health*. 1994;11(1):3-11.
18. Adulyanon S, Vourapukjaru J, Sheiham A. Oral impacts affecting daily performance in a low dental disease Thai population. *Community Dentistry and Oral Epidemiology*. 1996;24(6):385-9.
19. Slade GD. Derivation and validation of a short-form oral health impact profile. *Community dentistry and oral epidemiology*. 1997;25(4):284-90.
20. Slade GD. Measuring oral health and quality of life: Department of Dental Ecology, School of Dentistry, University of North Carolina; 1997.
21. Atchison KA, Dolan TA. Development of the geriatric oral health assessment index. *Journal of dental education*. 1990;54(11):680-7.
22. Idler EL, Benyamini Y. Self-rated health and mortality: a review of twenty-seven community studies. *Journal of health and social behavior*. 1997:21-37.
23. Smith AM, Shelley JM, Dennerstein L. Self-rated health: biological continuum or social discontinuity? *Social Science & Medicine*. 1994;39(1):77-83.
24. Wilson IB, Cleary PD. Linking clinical variables with health-related quality of life: a conceptual model of patient outcomes. *Jama*. 1995;273(1):59-65.
25. Dikbas I, Tanalp J, Tomruk CO, Koksall T. Evaluation of reasons for extraction of crowned teeth: a prospective study at a university clinic. *Acta Odontologica Scandinavica*. 2013;71(3-4):848-56.

26. Rosén B, Olavi G, Badersten A, Rönström A, Söderholm G, Egelberg J. Effect of different frequencies of preventive maintenance treatment on periodontal conditions: 5-year observations in general dentistry patients. *Journal of clinical periodontology*. 1999;26(4):225-33.
27. Linden GJ, Linden K, Yarnell J, Evans A, Kee F, Patterson CC. All-cause mortality and periodontitis in 60–70-year-old men: a prospective cohort study. *Journal of clinical periodontology*. 2012;39(10):940-6.
28. Chen X, Clark JJ, Naorungroj S. Length of tooth survival in older adults with complex medical, functional and dental backgrounds. *The Journal of the American Dental Association*. 2012;143(6):566-78.
29. Raval N, Johansson CS. Tooth loss in periodontally treated patients. A long-term study of periodontal disease and root caries. *Journal of clinical periodontology*. 2012;39(1):73-9.
30. Buchwald S, Kocher T, Biffar R, Harb A, Holtfreter B, Meisel P. Tooth loss and periodontitis by socio-economic status and inflammation in a longitudinal population-based study. *Journal of clinical periodontology*. 2013;40(3):203-11.
31. Locker D. The burden of oral disorders in a population of older adults. *Community dental health*. 1992;9(2):109-24.
32. Ranta K, Tuominen R, Paunio I. Perceived oral health status and ability to chew among an adult Finnish population. *Gerodontology*. 1987;3(3):136.
33. Reisine S, Bailit H. Clinical oral health status and adult perceptions of oral health. *Social Science & Medicine Part A: Medical Psychology & Medical Sociology*. 1980;14(6):597-605.
34. Arnljot HA, Barmes DE, Cohen LK, Hunter PB, Ship II. Oral health care systems: an international collaborative study. 1985.
35. Beck J. The epidemiology of root surface caries. *Journal of dental research*. 1990;69(5):1216-21.
36. Vehkalahti M, Paunio I. Occurrence of root caries in relation to dental health behavior. *Journal of dental research*. 1988;67(6):911-4.

37. Locker D, Leake J. Risk indicators and risk markers for periodontal disease experience in older adults living independently in Ontario, Canada. *Journal of dental research*. 1993;72(1):9-17.
38. Ogawa H, Yoshihara A, Hirotsu T, Ando Y, Miyazaki H. Risk factors for periodontal disease progression among elderly people. *Journal of clinical periodontology*. 2002;29(7):592-7.
39. Klock KS. Patients' perceptions of the decision-making process leading to extraction of permanent teeth in Norway. *Community dentistry and oral epidemiology*. 1995;23(3):165-9.
40. Thomson W, Poulton R, Kruger E, Boyd D. Socio-economic and behavioural risk factors for tooth loss from age 18 to 26 among participants in the Dunedin multidisciplinary health and development study. *Caries research*. 2000;34(5):361-6.
41. Thomson WM, Sheiham A, Spencer AJ. Sociobehavioral aspects of periodontal disease. *Periodontology 2000*. 2012;60(1):54-63.
42. Murray CJ, Vos T, Lozano R, Naghavi M, Flaxman AD, Michaud C, et al. Disability-adjusted life years (DALYs) for 291 diseases and injuries in 21 regions, 1990–2010: a systematic analysis for the Global Burden of Disease Study 2010. *The lancet*. 2012;380(9859):2197-223.
43. Chatrchaiwiwatana S. Factors affecting tooth loss among rural Khon Kaen adults: analysis of two data sets. *Public health*. 2007;121(2):106-12.
44. Gerritsen AE, Allen PF, Witter DJ, Bronkhorst EM, Creugers NH. Tooth loss and oral health-related quality of life: a systematic review and meta-analysis. *Health and quality of life outcomes*. 2010;8(1):126.
45. Musacchio E, Perissinotto E, Binotto P, Sartori L, Silva-Netto F, Zambon S, et al. Tooth loss in the elderly and its association with nutritional status, socio-economic and lifestyle factors. *Acta Odontologica Scandinavica*. 2007;65(2):78-86.
46. Furuta M, Yamashita Y. Oral health and swallowing problems. *Current physical medicine and rehabilitation reports*. 2013;1(4):216-22.
47. Hatch J, Shinkai R, Sakai S, Rugh J, Paunovich E. Determinants of masticatory performance in dentate adults. *Archives of oral biology*. 2001;46(7):641-8.

48. Ikebe K, Matsuda K-i, Morii K, Furuya-Yoshinaka M, Nokubi T, Renner RP. Association of masticatory performance with age, posterior occlusal contacts, occlusal force, and salivary flow in older adults. *International Journal of Prosthodontics*. 2006;19(5).
49. Ueno M, Yanagisawa T, Shinada K, Ohara S, Kawaguchi Y. Masticatory ability and functional tooth units in Japanese adults. *Journal of oral rehabilitation*. 2008;35(5):337-44.
50. Naka O, Anastassiadou V, Pissiotis A. Association between functional tooth units and chewing ability in older adults: a systematic review. *Gerodontology*. 2014;31(3):166-77.
51. Lamy M, Mojon P, Kalykakis G, Legrand R, Butz-Jorgensen E. Oral status and nutrition in the institutionalized elderly. *Journal of dentistry*. 1999;27(6):443-8.
52. Dion N, Cotart J-L, Rabilloud M. Correction of nutrition test errors for more accurate quantification of the link between dental health and malnutrition. *Nutrition*. 2007;23(4):301-7.
53. Ervin RB, Dye BA. The effect of functional dentition on Healthy Eating Index scores and nutrient intakes in a nationally representative sample of older adults. *Journal of public health dentistry*. 2009;69(4):207-16.
54. Marshall TA, Warren JJ, Hand JS, Xie X-J, Stumbo PJ. Oral health, nutrient intake and dietary quality in the very old. *The Journal of the American Dental Association*. 2002;133(10):1369-79.
55. Sahyoun NR, Lin C-L, Krall E. Nutritional status of the older adult is associated with dentition status. *Journal of the American Dietetic Association*. 2003;103(1):61-6.
56. Wakai K, Naito M, Naito T, Kojima M, Nakagaki H, Umemura O, et al. Tooth loss and intakes of nutrients and foods: a nationwide survey of Japanese dentists. *Community dentistry and oral epidemiology*. 2010;38(1):43-9.
57. Sheiham A, Steele J. Does the condition of the mouth and teeth affect the ability to eat certain foods, nutrient and dietary intake and nutritional status amongst older people? *Public health nutrition*. 2001;4(3):797-803.

58. Sheiham A, Steele J, Marcenes W, Lowe C, Finch S, Bates C, et al. The relationship among dental status, nutrient intake, and nutritional status in older people. *Journal of dental research*. 2001;80(2):408-13.
59. Lee JS, Weyant RJ, Corby P, Kritchevsky SB, Harris TB, Rooks R, et al. Edentulism and nutritional status in a biracial sample of well-functioning, community-dwelling elderly: the health, aging, and body composition study. *The American journal of clinical nutrition*. 2004;79(2):295-302.
60. Österberg T, Steen B. Relationship between dental state and dietary intake in 70-year-old males and females in Göteborg, Sweden: a population study. *Journal of Oral Rehabilitation*. 1982;9(6):509-21.
61. Ranta K. Dental status and intake of food items among an adult Finnish population. *Gerodontology*. 1988;4:32-5.
62. Steele J. National Diet and Nutrition Survey: people aged 65 years and over. Report of the oral health survey. 1998.
63. Srisilapanan P, Malikaew P, Sheiham A. Number of teeth and nutritional status in Thai older people. *Community dental health*. 2002;19(4):230-6.
64. Perera R, Ekanayake L. Relationship between nutritional status and tooth loss in an older population from Sri Lanka. *Gerodontology*. 2012;29(2):e566-e70.
65. Jung S, Ryu J, Jung D. Association of total tooth loss with socio-behavioural health indicators in Korean elderly. *Journal of oral rehabilitation*. 2011;38(7):517-24.
66. Chen CCH, Schilling LS, Lyder CH. A concept analysis of malnutrition in the elderly. *Journal of advanced nursing*. 2001;36(1):131-42.
67. Ekanayake L, Perera I. The association between clinical oral health status and oral impacts experienced by older individuals in Sri Lanka. *Journal of oral rehabilitation*. 2004;31(9):831-6.
68. John MT, Koepsell TD, Hujoel P, Miglioretti DL, LeResche L, Micheelis W. Demographic factors, denture status and oral health-related quality of life. *Community dentistry and oral epidemiology*. 2004;32(2):125-32.

69. John MT, LeResche L, Koepsell TD, Hujoel P, Miglioretti DL, Micheelis W. Oral health-related quality of life in Germany. *European journal of oral sciences*. 2003;111(6):483-91.
70. Čelebić A, Knezović-Zlatarić D. A comparison of patient's satisfaction between complete and partial removable denture wearers. *Journal of dentistry*. 2003;31(7):445-51.
71. Bae K, Kim C, Paik D, Kim J. A comparison of oral health related quality of life between complete and partial removable denture-wearing older adults in Korea. *Journal of oral rehabilitation*. 2006;33(5):317-22.
72. Wearers ECD. Correlation between quality of life and denture satisfaction in elderly complete denture wearers. *The International journal of prosthodontics*. 2001;14(1):77.
73. Agerberg G, Carlsson GE. Chewing ability in relation to dental and general health: analyses of data obtained from a questionnaire. *Acta Odontologica Scandinavica*. 1981;39(3):147-53.
74. Carlsson GE. Clinical morbidity and sequelae of treatment with complete dentures. *The Journal of prosthetic dentistry*. 1998;79(1):17-23.
75. Sheiham A, Croog SH. The psychosocial impact of dental diseases on individuals and communities. *Journal of behavioral medicine*. 1981;4(3):257-72.
76. Leao A, Sheiham A. Relation between clinical dental status and subjective impacts on daily living. *Journal of dental research*. 1995;74(7):1408-13.
77. Slade GD, Strauss RP, Atchison KA, Kressin NR, Locker D, Reisine ST. Conference summary: assessing oral health outcomes--measuring health status and quality of life. *Community dental health*. 1998;15(1):3-7.
78. Moroi H, Okimoto K, Terada Y. The effect of an oral prosthesis on the quality of life for head and neck cancer patients. *Journal of oral rehabilitation*. 1999;26(4):265-73.
79. Feine J, Carlsson G, Awad M, Chehade A, Duncan W, Gizani S, et al. The McGill Consensus Statement on Overdentures. Montreal, Quebec, Canada. May 24-25, 2002. *The International journal of prosthodontics*. 2002;15(4):413.

80. Sebring NG, Guckes AD, Li S-H, McCarthy GR. Nutritional adequacy of reported intake of edentulous subjects treated with new conventional or implant-supported mandibular dentures. *Journal of Prosthetic Dentistry*. 1995;74(4):358-63.
81. Allen F, McMillan A. Food selection and perceptions of chewing ability following provision of implant and conventional prostheses in complete denture wearers. *Clinical oral implants research*. 2002;13(3):320-6.
82. Shinkai RS, Hatch JP, Rugh JD, Sakai S, Mobley CC, Saunders MJ. Dietary intake in edentulous subjects with good and poor quality complete dentures. *The Journal of prosthetic dentistry*. 2002;87(5):490-8.
83. Peltola M, Raustia A, Salonen M. Effect of complete denture renewal on oral health—a survey of 42 patients. *Journal of oral rehabilitation*. 1997;24(6):419-25.
84. Davis E, Albino J, Tedesco L, Portenoy B, Ortman L. Expectations and satisfaction of denture patients in a university clinic. *Journal of Prosthetic Dentistry*. 1986;55(1):59-63.
85. Tsakos G, Marcenes W, Sheiham A. Cross-cultural differences in oral impacts on daily performance between Greek and British older adults. *Community dental health*. 2001;18(4):209-13.
86. Sheiham A, Steele JG, Marcenes W, Tsakos G, Finch S, Walls AW. Prevalence of impacts of dental and oral disorders and their effects on eating among older people; a national survey in Great Britain. *Community dentistry and oral epidemiology*. 2001;29(3):195-203.
87. Jones JA, Orner MB, Spiro III A, Kressin NR. Tooth loss and dentures: patients' perspectives. *International dental journal*. 2003;53(S5):327-34.
88. Demers M, Brodeur J, Simard P, Vallee R. Problems associated with edentulism among the elderly. *Journal (Canadian Dental Association)*. 1986;52(12):1019.
89. Ikebe K, Morii K, Kashiwagi J, Nokubi T, Ettinger RL. Impact of dry mouth on oral symptoms and function in removable denture wearers in Japan. *Oral Surgery, Oral Medicine, Oral Pathology, Oral Radiology, and Endodontology*. 2005;99(6):704-10.
90. Fox PC. Management of dry mouth. *Dental Clinics of North America*. 1997;41(4):863-75.

91. Billings R, Proskin H, Moss M. Xerostomia and associated factors in a community-dwelling adult population. *Community dentistry and oral epidemiology*. 1996;24(5):312-6.
92. Navazesh M, Mulligan R, Komaroff E, Redford M, Greenspan D, Pkelan J. The prevalence of xerostomia and salivary gland hypofunction in a cohort of HIV-positive and at-risk women. *Journal of dental research*. 2000;79(7):1502-7.
93. Närhi T. Prevalence of subjective feelings of dry mouth in the elderly. *Journal of dental research*. 1994;73(1):20-5.
94. Thomson WM, Chalmers JM, Spencer AJ, Slade GD. Medication and dry mouth: findings from a cohort study of older people. *Journal of public health dentistry*. 2000;60(1):12-20.
95. Matear DW, Locker D, Stephens M, Lawrence H. Associations between xerostomia and health status indicators in the elderly. *The journal of the Royal Society for the Promotion of Health*. 2006;126(2):79-85.
96. Moore PA, Guggenheimer J, Etzel KR, Weyant RJ, Orchard T. Type 1 diabetes mellitus, xerostomia, and salivary flow rates. *Oral Surgery, Oral Medicine, Oral Pathology, Oral Radiology, and Endodontology*. 2001;92(3):281-91.
97. Ship JA, Pillemer SR, Baum BJ. Xerostomia and the geriatric patient. *Journal of the American Geriatrics Society*. 2002;50(3):535-43.
98. Sreebny LM, Schwartz SS. A reference guide to drugs and dry mouth—2nd edition. *Gerodontology*. 1997;14(1):33-47.
99. Guggenheimer J, Moore PA. Xerostomia: etiology, recognition and treatment. *The Journal of the American Dental Association*. 2003;134(1):61-9.
100. Fox PC, Busch KA, Baum BJ. Subjective reports of xerostomia and objective measures of salivary gland performance. *The Journal of the American Dental Association*. 1987;115(4):581-4.
101. Enoki K, Matsuda K-i, Ikebe K, Murai S, Yoshida M, Maeda Y, et al. Influence of xerostomia on oral health-related quality of life in the elderly: a 5-year longitudinal study. *Oral surgery, oral medicine, oral pathology and oral radiology*. 2014;117(6):716-21.

102. Pihlstrom BL, Michalowicz BS, Johnson NW. Periodontal diseases. *The Lancet*. 2005;366(9499):1809-20.
103. Simons D, Brailsford S, Kidd E, Beighton D. Relationship between oral hygiene practices and oral status in dentate elderly people living in residential homes. *Community dentistry and oral epidemiology*. 2001;29(6):464-70.
104. Montal S, Tramini P, Triay JA, Valcarcel J. Oral hygiene and the need for treatment of the dependent institutionalised elderly. *Gerodontology*. 2006;23(2):67-72.
105. Andersson P, Hallberg I, Lorefält B, Unosson M, Renvert S. Oral health problems in elderly rehabilitation patients. *International journal of dental hygiene*. 2004;2(2):70-7.
106. Geismar K, Stoltze K, Sigurd B, Gyntelberg F, Holmstrup P. Periodontal disease and coronary heart disease. *Journal of periodontology*. 2006;77(9):1547-54.
107. Australian Research Centre for Population Oral Health TUoA, South Australia. The relationship between diabetes and oral health among Australian adults. *Australian dental journal*. 2008;53(1):93-6.
108. Martínez-Maestre MÁ, González-Cejudo C, Machuca G, Torrejon R, Castelo-Branco C. Periodontitis and osteoporosis: a systematic review. *Climacteric*. 2010;13(6):523-9.
109. Cullinan MP, Seymour GJ. Periodontal disease and systemic illness: will the evidence ever be enough? *Periodontology 2000*. 2013;62(1):271-86.
110. Otomo-Corgel J, Pucher JJ, Rethman MP, Reynolds MA. State of the science: chronic periodontitis and systemic health. *Journal of Evidence Based Dental Practice*. 2012;12(3):20-8.
111. Meurman JH, Sanz M, Janket S-J. Oral health, atherosclerosis, and cardiovascular disease. *Critical Reviews in Oral Biology & Medicine*. 2004;15(6):403-13.
112. Wolff LF. Diabetes and periodontal disease. *American journal of dentistry*. 2014;27(3):127-8.
113. Manfredi M, McCullough M, Vescovi P, Al-Kaarawi Z, Porter S. Update on diabetes mellitus and related oral diseases. *Oral diseases*. 2004;10(4):187-200.
114. Cohen DW, Friedman LA, Shapiro J, Kyle GC, Franklin S. Diabetes mellitus and periodontal disease: two-year longitudinal observations part I. *Journal of periodontology*. 1970;41(12):709-12.

115. Shlossman M, Knowler WC, Pettitt DJ, Genco RJ. Type 2 diabetes mellitus and periodontal disease. *The Journal of the American Dental Association*. 1990;121(4):532-6.
116. Emrich LJ, Shlossman M, Genco RJ. Periodontal disease in non-insulin-dependent diabetes mellitus. *Journal of periodontology*. 1991;62(2):123-31.
117. Seppälä B, Seppälä M, Ainamo J. A longitudinal study on insulin-dependent diabetes mellitus and periodontal disease. *Journal of clinical periodontology*. 1993;20(3):161-5.
118. Campus G, Salem A, Uzzau S, Baldoni E, Tonolo G. Diabetes and periodontal disease: a case-control study. *Journal of periodontology*. 2005;76(3):418-25.
119. Lalla E, Park DB, Papapanou PN, Lamster IB. Oral disease burden in Northern Manhattan patients with diabetes mellitus. *Am J Public Health*. 2004;94(5):755-8.
120. Collin H-L, Uusitupa M, Niskanen L, Kontturi-Närhi V, Markkanen H, Koivisto A-M, et al. Periodontal findings in elderly patients with non-insulin dependent diabetes mellitus. *Journal of periodontology*. 1998;69(9):962-6.
121. Karikoski A, Ilanne-Parikka P, Murtomaa H. Oral self-care among adults with diabetes in Finland. *Community dentistry and oral epidemiology*. 2002;30(3):216-23.
122. Petersen PE, Bourgeois D, Ogawa H, Estupinan-Day S, Ndiaye C. The global burden of oral diseases and risks to oral health. *Bulletin of the World Health Organization*. 2005;83:661-9.
123. Carranza ET, Cossío PI, Guisado JMH, Aumente EH, Perez J. Assessment of quality of life in oral cancer. *Med Oral Patol Oral Cir Bucal*. 2008;13(11):E735-41.
124. Kleihues P. *World Cancer Report*. International Agency for Research on Cancer IARC Press, Lyon, France. 2003.
125. Thomas G, Hashibe M, Jacob BJ, Ramadas K, Mathew B, Sankaranarayanan R, et al. Risk factors for multiple oral premalignant lesions. *International journal of cancer*. 2003;107(2):285-91.
126. Jankittivong A, Aneksuk V, Langlais R. Oral mucosal conditions in elderly dental patients. *Oral diseases*. 2002;8(4):218-23.

127. García-Pola Vallejo M, Martínez Díaz-Canel A, García Martín J, González García M. Risk factors for oral soft tissue lesions in an adult Spanish population. *Community dentistry and oral epidemiology*. 2002;30(4):277-85.
128. Sheiham A, Maizels J, Cushing A, Holmes J. Dental attendance and dental status. *Community dentistry and oral epidemiology*. 1985;13(6):304-9.
129. Todd J, Lader D. Adult dental health, UK 1988. Office of Population Censuses and Surveys. London: HMSO; 1991.
130. Murray J. Attendance patterns and oral health. *British dental journal*. 1996;181(9):339.
131. Kay EJ. How often should we go to the dentist?: About once a year—but rates of disease progression vary greatly. *BMJ: British Medical Journal*. 1999;319(7204):204.
132. Slade GD, Spencer A, Roberts-Thomson KF. Australia's Dental Generations: The National Survey of Adult Oral Health, 2004-06: Australian Institute of Health and Welfare; 2007.
133. Thomson W, Williams S, Broadbent J, Poulton R, Locker D. Long-term dental visiting patterns and adult oral health. *Journal of Dental Research*. 2010;89(3):307-11.
134. Frazier PJ, Jenny J, Bagramian RA, Robinson E, Proshek JM. Provider expectations and consumer perceptions of the importance and value of dental care. *American Journal of Public Health*. 1977;67(1):37-43.
135. GIFT HC. Utilization of professional dental services. *Social sciences and dentistry*. 1984:202-66.
136. Mofidi M, Rozier RG, King RS. Problems with access to dental care for Medicaid-insured children: what caregivers think. *American Journal of Public Health*. 2002;92(1):53-8.
137. Tickle M, Milsom K, Humphris G, Blinkhorn A. Parental attitudes to the care of the carious primary dentition. *British dental journal*. 2003;195(8):451.
138. Astrom AN, Ekback G, Nasir E, Ordell S, Unell L. Use of dental services throughout middle and early old ages: a prospective cohort study. *Community dentistry and oral epidemiology*. 2013;41(1):30-9.

139. Gilbert GH, Stoller EP, Duncan RP, Earls JL, Campbell AM. Dental self-care among dentate adults: contrasting problem-oriented dental attenders and regular dental attenders. *Special care in Dentistry*. 2000;20(4):155-63.
140. Crocombe LA, Broadbent JM, Thomson WM, Brennan DS, Poulton R. Impact of dental visiting trajectory patterns on clinical oral health and oral health-related quality of life. *Journal of public health dentistry*. 2012;72(1):36-44.
141. Padilha DM, Hugo FN, Hilgert JB, Dal Moro RG. Hand Function and Oral Hygiene in Older Institutionalized Brazilians: (See Editorial Comments by Dr. Kenneth Shay on pp 1470–1471). *Journal of the American Geriatrics Society*. 2007;55(9):1333-8.
142. Walls A. Developing pathways for oral care in elders: challenges in care for the dentate the subject? *Gerodontology*. 2014;31:25-30.
143. MacEntee MI. Oral healthcare and the frail elder: a clinical perspective: John Wiley & Sons; 2010.
144. Artnik B, Premik M, Zaletel-Kragelj L. Population groups at high risk for poor oral self care: the basis for oral health promotion. *International journal of public health*. 2008;53(4):195-203.
145. Dolan TA, Peek CW, Stuck AE, Beck JC. Functional Health and Dental Service Use Among Older Adults Teresa Adults. *The Journals of Gerontology Series A: Biological Sciences and Medical Sciences*. 1998;53(6):M413-M8.
146. Borreani E, Wright D, Scambler S, Gallagher JE. Minimising barriers to dental care in older people. *BMC Oral Health*. 2008;8(1):7.
147. Kiyak HA, Reichmuth M. Barriers to and enablers of older adults' use of dental services. *Journal of dental education*. 2005;69(9):975-86.
148. Baker S. Applying Andersen's behavioural model to oral health: what are the contextual factors shaping perceived oral health outcomes? *Community Dentistry and Oral Epidemiology*. 2009;37(6):485-94.
149. Albandar JM, Streckfus CF, Adesanya MR, Winn DM. Cigar, pipe, and cigarette smoking as risk factors for periodontal disease and tooth loss. *Journal of periodontology*. 2000;71(12):1874-81.

150. Strandberg AY, Strandberg TE, Pitkälä K, Salomaa VV, Tilvis RS, Miettinen TA. The effect of smoking in midlife on health-related quality of life in old age: a 26-year prospective study. *Archives of internal medicine*. 2008;168(18):1968-74.
151. Grath CM, Bedi R, Gilthorpe MS. Oral health related quality of life--views of the public in the United Kingdom. *Community Dent Health*. 2000;17(1):3-7.
152. Locker D, Slade G. Association between clinical and subjective indicators of oral health status in an older adult population. *Gerodontology*. 1994;11(2):108-14.
153. Srisilapanan P, Sheiham A. The prevalence of dental impacts on daily performances in older people in Northern Thailand. *Gerodontology*. 2001;18(2):102-8.
154. Steele JG, Sanders AE, Slade GD, Allen PF, Lahti S, Nuttall N, et al. How do age and tooth loss affect oral health impacts and quality of life? A study comparing two national samples. *Community dentistry and oral epidemiology*. 2004;32(2):107-14.
155. Patrick DL, Lee RSY, Nucci M, Grembowski D, Jolles CZ, Milgrom P, editors. Reducing oral health disparities: a focus on social and cultural determinants. *BMC Oral Health*; 2006: BioMed Central.
156. Bailit HL, Newhouse J, Brook R, Duan N, Collins C, Hanley J, et al. Dental insurance and the oral health of preschool children. *The Journal of the American Dental Association*. 1986;113(5):773-6.
157. Tetuan TM, McGlasson D, Meyer I. Oral health screening using a caries detection device. *The Journal of school nursing*. 2005;21(5):299-306.
158. Somkotra T. Experience of socioeconomic-related inequality in dental care utilization among Thai elderly under universal coverage. *Geriatrics & gerontology international*. 2013;13(2):298-306.
159. Somkotra T. Geriatric Dentistry in Thailand: Reviewing the past and defining the future. *Bio-Environmental Approach Towards Happy Aging Society Bangkok: Concept Medical Publishing Ltd*. 2010:87-96.
160. Ettinger R, Beck J. Medical and psychosocial risk factors in the dental treatment of the elderly. *International dental journal*. 1983;33(3):292-300.

161. Shay K, Berkey D, Beck J, editors. The First International Conference on rural Ageing: A Global Challenge. Proceedings of the oral health component Charleston, Virginie occidentale (Etats-Unis d'Amérique); 2000.
162. Kandelman D. Dental needs of the elderly: a comparison between some European and North American surveys. *Community Dent Health*. 1986;3:19-39.
163. Petersen PE, Nörtov B. General and dental health in relation to life-style and social network activity among 67-year-old Danes. *Scandinavian journal of primary health care*. 1989;7(4):225-30.
164. Shah N, Sundaram K. Impact of socio-demographic variables, oral hygiene practices and oral habits on periodontal health status of Indian elderly: a community-based study. *Indian journal of dental research: official publication of Indian Society for Dental Research*. 2003;14(4):289-97.
165. Avlund K, Holm-Pedersen P, Schroll M. Functional ability and oral health among older people: a longitudinal study from age 75 to 80. *Journal of the American Geriatrics Society*. 2001;49(7):954-62.
166. Chalmers JM. Oral health promotion for our ageing Australian population. *Australian Dental Journal*. 2003;48(1):2-9.
167. Österberg T, Mellström D, Sundh V. Dental health and functional ageing: A Study of 70-year-old people. *Community dentistry and oral epidemiology*. 1990;18(6):313-8.
168. Norlén P, Östberg H, Björn AL. Relationship between general health, social factors and oral health in women at the age of retirement. *Community Dentistry and Oral Epidemiology*. 1991;19(5):296-301.
169. Stein PS, Henry RG. Poor oral hygiene in long-term care. *AJN The American Journal of Nursing*. 2009;109(6):44-50.
170. Gil-Montoya JA, de Mello ALF, Cardenas CB, Lopez IG. Oral health protocol for the dependent institutionalized elderly. *Geriatric Nursing*. 2006;27(2):95-101.
171. Murray P, Ede-Nichols D, Garcia-Godoy F. Oral health in Florida nursing homes. *International journal of dental hygiene*. 2006;4(4):198-203.
172. De Mello ALSF, Padilha DMP. Oral health care in private and small long-term care facilities: a qualitative study. *Gerodontology*. 2009;26(1):53-7.

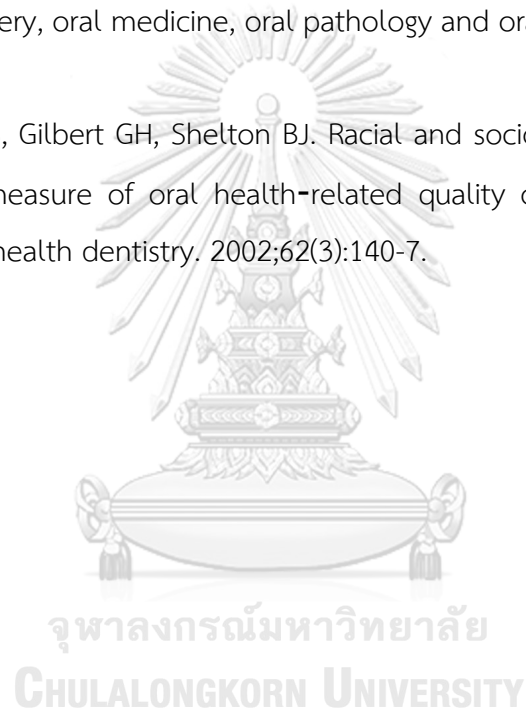
173. Young BC, Murray CA, Thomson J. Care home staff knowledge of oral care compared to best practice: a West of Scotland pilot study. *British dental journal*. 2008;205(8):E15.
174. Prakongsai P, Limwattananon S, Tangcharoensathien V. The equity impact of the universal coverage policy: lessons from Thailand. *Innovations in health system finance in developing and transitional economies*: Emerald Group Publishing Limited; 2009. p. 57-81.
175. Somkotra T, Detsomboonrat P. Is there equity in oral healthcare utilization: experience after achieving Universal Coverage. *Community dentistry and oral epidemiology*. 2009;37(1):85-96.
176. Somkotra T, Vachirarojpisan T. Inequality in dental care utilisation among Thai children: evidence from Thailand where universal coverage has been achieved. *International dental journal*. 2009;59(6):349-57.
177. Somkotra T. Socioeconomic inequality in self-reported oral health status: the experience of Thailand after implementation of the universal coverage policy. *Community dental health*. 2011;28(2):136-42.
178. Kida IA, Åström AN, Strand GV, Masalu JR, Tsakos G. Psychometric properties and the prevalence, intensity and causes of oral impacts on daily performance (OIDP) in a population of older Tanzanians. *Health and quality of life outcomes*. 2006;4(1):56.
179. Bureau of dental health T. Report on the eighth national oral health survey of Thailand(2017). 2018.
180. Silva NN, Roncalli AG. [Sampling plan, weighting process and design effects of the Brazilian Oral Health Survey]. *Revista de saude publica*. 2013;47 Suppl 3:3-11.
181. Organization WH. Oral health surveys: basic methods: World Health Organization; 2013.
182. Division DH. The 7th national oral health survey of Thailand report. Nonthaburi: Department of Health, Ministry of Public Health; 2012 Available from: <http://dental.anamai.moph.go.th/survey7.PDF>.
183. Horowitz AM, Kleinman DV. Oral health literacy: the new imperative to better oral health. *Dental Clinics of North America*. 2008;52(2):333-44.

184. Lo E, Lin H, Wang Z, Wong M, Schwarz E. Utilization of dental services in Southern China. *Journal of dental research*. 2001;80(5):1471-4.
185. Thanakanjanaphakdee W, Laohasiriwong W, Puttanapong N. Spatial distribution of dentists in Thailand. *Journal of International Oral Health*. 2019;11(6):340.
186. Arcury TA, Gesler WM, Preisser JS, Sherman J, Spencer J, Perin J. The effects of geography and spatial behavior on health care utilization among the residents of a rural region. *Health services research*. 2005;40(1):135-56.
187. Wu B. Dental service utilization among urban and rural older adults in China—a brief communication. *Journal of public health dentistry*. 2007;67(3):185-8.
188. Ohi T, Sai M, Kikuchi M, Hattori Y, Tsuboi A, Hozawa A, et al. Determinants of the utilization of dental services in a community-dwelling elderly Japanese population. *The Tohoku journal of experimental medicine*. 2009;218(3):241-9.
189. Burr JA, Lee HJ. Social relationships and dental care service utilization among older adults. *Journal of aging and health*. 2013;25(2):191-220.
190. Lau DT, Kirby JB. The relationship between living arrangement and preventive care use among community-dwelling elderly persons. *American Journal of Public Health*. 2009;99(7):1315-21.
191. Sugihara N, Tsuchiya K, Hosaka M, Osawa H, Yamane G-y, Matsukubo T. Dental-care utilization patterns and factors associated with regular dental check-ups in elderly. *The Bulletin of Tokyo Dental College*. 2010;51(1):15-21.
192. Slack-Smith L, Hyndman J. The relationship between demographic and health-related factors on dental service attendance by older Australians. *British dental journal*. 2004;197(4):193.
193. Österberg T, Lundgren M, Emilson C-G, Sundh V, Birkhed D, Steen B. Utilization of dental services in relation to socioeconomic and health factors in the middle-aged and elderly Swedish population. *Acta Odontologica Scandinavica*. 1998;56(1):41-7.
194. Sakki TK, Knuuttila ML, Anttila SS. Lifestyle, gender and occupational status as determinants of dental health behavior. *Journal of clinical periodontology*. 1998;25(7):566-70.
195. Tan H, Peres K, Peres M. Retention of teeth and oral health-related quality of life. *Journal of dental research*. 2016;95(12):1350-7.

196. Oh SH, Kim Y, Park JY, Jung YJ, Kim SK, Park SY. Comparison of fixed implant-supported prostheses, removable implant-supported prostheses, and complete dentures: patient satisfaction and oral health-related quality of life. *Clinical oral implants research*. 2016;27(2):e31-e7.
197. Yiengprugsawan V, Somkotra T, Seubsman S-a, Sleigh AC, Team TCS. Oral Health-Related Quality of Life among a large national cohort of 87,134 Thai adults. *Health and Quality of life Outcomes*. 2011;9(1):42.
198. Zeng X, Sheiham A, Tsakos G. Relationship between clinical dental status and eating difficulty in an old Chinese population. *Journal of oral rehabilitation*. 2008;35(1):37-44.
199. Jensen PM, Saunders RL, Thierer T, Friedman B. Factors associated with oral health-related quality of life in community-dwelling elderly persons with disabilities. *Journal of the American Geriatrics Society*. 2008;56(4):711-7.
200. Hyde S, Satariano WA, Weintraub JA. Welfare dental intervention improves employment and quality of life. *Journal of dental research*. 2006;85(1):79-84.
201. Lai DW, Hui NT. Use of dental care by elderly Chinese immigrants in Canada. *Journal of public health dentistry*. 2007;67(1):55-9.
202. Mann C. Observational research methods. *Research design II: cohort, cross sectional, and case-control studies*. *Emergency medicine journal*. 2003;20(1):54-60.
203. Åstrøm A, Haugejorden O, Skaret E, Trovik T, Klock K. Oral Impacts on Daily Performance in Norwegian adults: validity, reliability and prevalence estimates. *European journal of oral sciences*. 2005;113(4):289-96.
204. Åstrøm A, Haugejorden O, Skaret E, Trovik T, Klock K. Oral impacts on daily performance in Norwegian adults: the influence of age, number of missing teeth, and socio-demographic factors. *European journal of oral sciences*. 2006;114(2):115-21.
205. Department of health MoPH. strategic planning 2017-2021. p. 39.
206. Petersen PE, Yamamoto T. Improving the oral health of older people: the approach of the WHO Global Oral Health Programme. *Community dentistry and oral epidemiology*. 2005;33(2):81-92.

207. Hobdell M, Petersen PE, Clarkson J, Johnson N. Global goals for oral health 2020. *International dental journal*. 2003;53(5):285-8.
208. Petersen PE, Kwan S. World Health Organization global oral health strategies for oral health promotion and disease prevention in the twenty-first century. *Prävention und Gesundheitsförderung*. 2009;4(2):100-4.
209. Watt RG. From victim blaming to upstream action: tackling the social determinants of oral health inequalities. *Community dentistry and oral epidemiology*. 2007;35(1):1-11.
210. John MT, Slade GD, Szentpétery A, Setz JM. Oral Health--Related Quality of Life in Patients Treated with Fixed, Removable, and Complete Dentures 1 Month and 6 to 12 Months After Treatment. *International Journal of Prosthodontics*. 2004;17(5).
211. Visscher C, Lobbezoo F, Schuller A. Dental status and oral health-related quality of life. A population-based study. *Journal of oral rehabilitation*. 2014;41(6):416-22.
212. Slade GD, Sanders AE. The paradox of better subjective oral health in older age. *Journal of dental research*. 2011;90(11):1279-85.
213. Azevedo MS, Correa MB, Azevedo JS, Demarco FF. Dental prosthesis use and/or need impacting the oral health-related quality of life in Brazilian adults and elders: Results from a National Survey. *Journal of dentistry*. 2015;43(12):1436-41.
214. Joseph AG, Chandrashekar Janakiram AM. Prosthetic Status, Needs and Oral Health Related Quality of Life (OHRQOL) in the Elderly Population of Aluva, India. *Journal of clinical and diagnostic research: JCDR*. 2016;10(11):ZC05.
215. Locker D, Allen PF. Developing short-form measures of oral health-related quality of life. *Journal of public health dentistry*. 2002;62(1):13-20.
216. Adulyanon S, Sheiham A. Oral impacts on daily performances. Measuring oral health and quality of life. 1997;151:160.
217. Ikebe K, Watkins CA, Ettinger RL, Sajima H, Nokubi T. Application of short-form oral health impact profile on elderly Japanese. *Gerodontology*. 2004;21(3):167-76.
218. Almoznino G, Aframian D, Sharav Y, Sheftel Y, Mirzabaev A, Zini A. Lifestyle and dental attendance as predictors of oral health-related quality of life. *Oral diseases*. 2015;21(5):659-66.


219. Montero J, Albaladejo A, Zalba JI. Influence of the usual motivation for dental attendance on dental status and oral health-related quality of life. *Medicina oral, patologia oral y cirugia bucal*. 2014;19(3):e225.
220. Allen E, Ziada H, O'halloran D, Clerehugh V, Allen P. Attitudes, awareness and oral health-related quality of life in patients with diabetes. *Journal of oral rehabilitation*. 2008;35(3):218-23.
221. Osailan S, Pramanik R, Shirlaw P, Proctor G, Challacombe S. Clinical assessment of oral dryness: development of a scoring system related to salivary flow and mucosal wetness. *Oral surgery, oral medicine, oral pathology and oral radiology*. 2012;114(5):597-603.
222. Chavers LS, Gilbert GH, Shelton BJ. Racial and socioeconomic disparities in oral disadvantage, a measure of oral health-related quality of life: 24-month incidence. *Journal of public health dentistry*. 2002;62(3):140-7.



APPENDIX A

QUESTIONNAIRE FOR SOCIAL BACKGROUNDS, ORAL BEHAVIORS, DENTAL SERVICE UTILIZATION, CHRONIC HEALTH CONDITIONS AND ORAL HEALTH RELATED QUALITY OF LIFE

1
ID □-□□-□□□□

 <p>แบบสัมภาษณ์กลุ่มอายุ 60 – 74 ปี โครงการสำรวจสภาวะสุขภาพช่องปากแห่งชาติ ครั้งที่ 8 พ.ศ.2560</p>

ตำบล.....อำเภอ.....จังหวัด.....

ผู้สัมภาษณ์..... วัน เดือน ปี ที่สัมภาษณ์/...../2560

คำชี้แจง: จงทำเครื่องหมาย X ลงใน □ หน้าข้อความคำตอบและเติมข้อความลงในช่องว่าง.....ตามความเป็นจริง

ส่วนที่ 1: ข้อมูลทั่วไป

1. เพศ ¹ชาย ²หญิง
2. อายุ.....ปี.....เดือน
3. น้ำหนัก.....กก. ส่วนสูง.....ซม.
4. ศาสนา ¹พุทธ ²อิสลาม ³คริสต์ ⁴อื่นๆ ระบุ.....
5. สถานภาพสมรส ¹โสด ²สมรส ³หม้าย ⁴หย่าร้าง ⁵แยกกันอยู่
6. อาชีพหลักหรืองานที่ใช้เวลาส่วนใหญ่ (ให้บันทึกสถานภาพการทำงาน)

<input type="checkbox"/> ⁰¹ ข้าราชการ/พนักงานราชการ/ลูกจ้างของรัฐ/พนักงานรัฐวิสาหกิจ	<input type="checkbox"/> ⁰³ ค้าขาย/ประกอบธุรกิจส่วนตัว
<input type="checkbox"/> ⁰² พนักงาน/ลูกจ้างเอกชน	<input type="checkbox"/> ⁰⁵ รับจ้างทั่วไป
<input type="checkbox"/> ⁰⁴ เกษตรกร	<input type="checkbox"/> ⁰⁷ ขับรถรับจ้างสาธารณะ
<input type="checkbox"/> ⁰⁶ นักเรียน/นิสิต/นักศึกษา	<input type="checkbox"/> ⁰⁹ วางงาน/ไม่มีงานทำ
<input type="checkbox"/> ⁰⁸ แม่บ้าน/พ่อบ้าน	<input type="checkbox"/> ¹⁰ อื่นๆ ระบุ.....
7. ปัจจุบัน ท่านมีสวัสดิการสุขภาพอะไร (ตอบได้มากกว่า 1 ข้อ)

<input type="radio"/> ⁰¹ สิทธิ 30 บาท (บัตรประกันสุขภาพถ้วนหน้า)	<input type="radio"/> ⁰² สิทธิประกันสังคม/กองทุนทดแทน
<input type="radio"/> ⁰³ สิทธิข้าราชการหรือข้าราชการบำนาญ	<input type="radio"/> ⁰⁴ รัฐวิสาหกิจ
<input type="radio"/> ⁰⁵ หน่วยงานอิสระของรัฐ	<input type="radio"/> ⁰⁶ องค์กรปกครองส่วนท้องถิ่น
<input type="radio"/> ⁰⁷ ประกันสุขภาพกับบริษัทประกัน	<input type="radio"/> ⁰⁸ สวัสดิการจัดโดยนายจ้าง
<input type="radio"/> ⁰⁹ อื่นๆ ระบุ.....	<input type="radio"/> ¹⁰ ไม่มี <input type="radio"/> ¹¹ ไม่ทราบ
8. รายได้ของท่าน (เฉลี่ยต่อเดือน)

<input type="checkbox"/> ⁰ ไม่มีรายได้	<input type="checkbox"/> ¹ รายได้ 1-5,000 บาท
<input type="checkbox"/> ² รายได้ 5,001 – 15,000 บาท	<input type="checkbox"/> ³ รายได้ 15,001 – 30,000 บาท
<input type="checkbox"/> ⁴ รายได้ 30,001 – 50,000 บาท	<input type="checkbox"/> ⁵ รายได้ ตั้งแต่ 50,001 บาทขึ้นไป
9. การศึกษา (ระบุการศึกษาขั้นสูงสุด)

<input type="checkbox"/> ⁰ ไม่เคยเรียน	<input type="checkbox"/> ¹ ประถมศึกษา
<input type="checkbox"/> ² มัธยมศึกษาตอนต้น	<input type="checkbox"/> ³ มัธยมศึกษาตอนปลาย
<input type="checkbox"/> ⁴ ปวช.	<input type="checkbox"/> ⁵ ปวส./ปวท./อนุปริญญา
<input type="checkbox"/> ⁶ ปริญญาตรี	<input type="checkbox"/> ⁷ ปริญญาโทหรือสูงกว่า
<input type="checkbox"/> ⁸ อื่นๆ (ระบุ).....	

10. ท่านมีโรคประจำตัวหรือโรคทางระบบที่แพทย์ระบุหรือไม่ (ลงข้อมูลทุกข้อ)
- 10.1 เบาหวาน ⁰ ไม่มี ¹ มี/กินยาประจำ ² มี/ไม่กินยา ³ ไม่ทราบ/ไม่เคยตรวจ
- 10.2 ความดันโลหิตสูง ⁰ ไม่มี ¹ มี/กินยาประจำ ² มี/ไม่กินยา ³ ไม่ทราบ/ไม่เคยตรวจ
- 10.3 หัวใจและหลอดเลือด ⁰ ไม่มี ¹ มี/กินยาประจำ ² มี/ไม่กินยา ³ ไม่ทราบ/ไม่เคยตรวจ
- 10.4 ไขมันในเลือดสูง ⁰ ไม่มี ¹ มี/กินยาประจำ ² มี/ไม่กินยา ³ ไม่ทราบ/ไม่เคยตรวจ
- 10.5 ภูมิแพ้ ⁰ ไม่มี ¹ มี/กินยาประจำ ² มี/ไม่กินยา ³ ไม่ทราบ/ไม่เคยตรวจ
- 10.6 ภาวะซึมเศร้า ⁰ ไม่มี ¹ มี/กินยาประจำ ² มี/ไม่กินยา ³ ไม่ทราบ/ไม่เคยตรวจ
- 10.7 มะเร็ง ตำแหน่ง..... ⁰ ไม่มี ¹ มี/กินยาประจำ ² มี/ไม่กินยา ³ ไม่ทราบ/ไม่เคยตรวจ
- 10.8 อื่นๆ ระบุ..... ¹ มี/กินยาประจำ ² มี/ไม่กินยา
11. การช่วยเหลือตนเอง
- ¹ ช่วยเหลือตนเองได้ดี ² มีการพึ่งพาเมื่อออกนอกบ้าน ³ พึ่งพาตลอดเวลา

ส่วนที่ 2: พฤติกรรมสุขภาพ

2.1 พฤติกรรมการแปร่งฟัน

⇒ กรณีมีฟันแท้อย่างน้อย 1 ซี่ (นับรวมฟันเทียมชนิดติดแน่น แต่ไม่นับรวมรากเทียมแบบ coping)

- ส่วนใหญ่ท่านแปร่งฟันในเวลาต่อไปนี้หรือไม่
 - ตื่นนอนตอนเช้า ⁰ ไม่เคยเลย ¹ แปร่งเป็นบางวัน ² ทุกวัน
 - หลังอาหารเช้า ⁰ ไม่เคยเลย ¹ แปร่งเป็นบางวัน ² ทุกวัน
 - หลังอาหารกลางวัน ⁰ ไม่เคยเลย ¹ แปร่งเป็นบางวัน ² ทุกวัน
 - ก่อนนอน ⁰ ไม่เคยเลย ¹ แปร่งเป็นบางวัน ² ทุกวัน
- ท่านแปร่งฟันก่อนนอนแล้วเช้านอนทันที ไซ่หรือไม่ ⁰ ไม่ไซ่ ¹ ไซ่
- ในการแปร่งฟันแต่ละครั้ง ท่านแปร่งฟันนานกี่นาที
 ¹ ประมาณ 1 นาที ² ประมาณ 2 นาที ³ 2 นาทีขึ้นไป ² ไม่ทราบ/ไม่แน่นอน
- แปร่งสีฟันที่ท่านใช้ที่บ้าน มีขนแปร่งแบบใด (เทียบกับแปร่งที่แจก)
 ¹ ขนนุ่มเท่ากัน ² นุ่มมากกว่าที่แจก ³ แข็งกว่าที่แจก
- เมื่อแปร่งฟันที่บ้าน ท่านใช้ยาสีฟันยี่ห้ออะไร
 ⁰ ไม่ใช้ยาสีฟัน
 ¹ ไซ่ ⇒ ให้ระบุยี่ห้อที่ใช้(เลือกชนิดที่ใช้บ่อยที่สุด 1 ชนิด)

<input type="checkbox"/> ⁰¹ คอลเกต	<input type="checkbox"/> ⁰² ไกลซ์ซิด	<input type="checkbox"/> ⁰³ ฟลูออคาริล	<input type="checkbox"/> ⁰⁴ ดาร์ลี
<input type="checkbox"/> ⁰⁵ พาโรดอนแท็ก	<input type="checkbox"/> ⁰⁶ พาโรดอนแท็กเอฟ	<input type="checkbox"/> ⁰⁷ ซอลท์	<input type="checkbox"/> ⁰⁸ ซอลท์เอฟ
<input type="checkbox"/> ⁰⁹ เซนโซดาเยน	<input type="checkbox"/> ¹⁰ เซนโซดาเยนเอฟ	<input type="checkbox"/> ¹¹ ซิสเต็มมา	<input type="checkbox"/> ¹² ออร์ลิเมต
<input type="checkbox"/> ¹³ เดนติสแต้	<input type="checkbox"/> ¹⁴ โคโคโม	<input type="checkbox"/> ¹⁵ ดีนี่ (D-nee)	<input type="checkbox"/> ¹⁶ เซนต์แอนดรูว์
<input type="checkbox"/> ¹⁷ ซูเลียน (smile-on)	<input type="checkbox"/> ¹⁸ ซือสตัย	<input type="checkbox"/> ¹⁹ สปราร์คเคิล	<input type="checkbox"/> ²⁰ เอมไทย
<input type="checkbox"/> ²¹ วิเศษนิยม	<input type="checkbox"/> ²² ทิพย์นิยม	<input type="checkbox"/> ²³ ดอกบัวคู่	<input type="checkbox"/> ²⁴ จาเป่า
<input type="checkbox"/> ²⁵ กิฟฟาริน (ไบโอเทค, ไบโอเฮอร์เบิล)	<input type="checkbox"/> ²⁶ แอมเวย์ (กลิสเตอร์)	<input type="checkbox"/> ²⁷ เทสโก้ โลตัส	
<input type="checkbox"/> ²⁸ ผลิตภัณฑ์ชาวบ้านทำเอง ระบุยี่ห้อ.....	<input type="checkbox"/> ²⁹ อื่นๆ ระบุยี่ห้อ.....		

สำนักทันตสาธารณสุข กรมอนามัย กระทรวงสาธารณสุข

3. ท่านพึงพอใจต่อสุขภาพช่องปากของท่านเพียงใด
- ⁰ ไม่พอใจ ¹ พอใจปานกลาง ² พอใจมาก
4. ท่านเคยได้รับความรู้เกี่ยวกับสุขภาพช่องปากจากแหล่งใดบ้าง (ตอบได้มากกว่า 1 ข้อ)
- ⁰¹ เว็บไซต์/เฟซบุค/ไลน์ ⁰² วิทยุ วิทยุชุมชน ⁰³ เสียงตามสาย/หอกระจายข่าว
- ⁰⁴ โปสเตอร์ แผ่นพับ ⁰⁵ โทรทัศน์ ⁰⁶ พ่อ แม่ ญาติพี่น้อง
- ⁰⁷ ครู ⁰⁸ หมอ/พยาบาล/เจ้าหน้าที่สาธารณสุข
- ⁰⁹ อสม. ¹⁰ เพื่อน ¹¹ หนังสือ/วารสาร/หนังสือพิมพ์
- ¹² อื่นๆ ระบุ.....
5. ในรอบปีที่ผ่านมา ท่านเคยไปหาหมอฟันบ้างหรือไม่
- ⁰ จำไม่ได้ (ไม่ต้องถามต่อ)
- ¹ ไม่เคยไป ⇒ ให้ระบุเหตุผลที่ไม่ไป (ตอบได้มากกว่า 1 ข้อ)
- ¹ ไม่มีเวลา ² ไม่มีคนพาไป ³ ไม่มีอาการผิดปกติ
- ⁴ รอนาน ⁵ กลัวการทำฟัน ⁶ ค่ารักษาแพง
- ⁷ อื่น ๆ ระบุ.....
- ² เคยไป จำนวนครั้ง
- ⇒ ให้ระบุเหตุผลที่ท่านเคยไปหาหมอฟัน (ตอบได้มากกว่า 1 ข้อ)
- ¹ ต้องการตรวจเช็ค ยังไม่มีอาการ ² ต้องการใส่ฟันเทียม
- ³ รู้สึกมีฟันผุ/มีจุดดำบนตัวฟัน ⁴ ปวดฟัน/เสียวฟัน
- ⁵ รู้สึกมีหินปูน ⁶ รู้สึกมีเหงือกอักเสบ
- ⁷ รู้สึกมีอาการบวม/มีหนอง ⁸ มีแผลในปาก
- ⁹ อื่น ๆ ระบุ
- ⇒ ให้ระบุสถานที่ที่ท่านไปหาหมอฟัน (ตอบได้มากกว่า 1 ข้อ)
- ¹ รพ.สต./ PCU
- ² โรงพยาบาลชุมชน
- ³ โรงพยาบาลจังหวัด/โรงพยาบาลศูนย์/ศูนย์อนามัย
- ⁴ โรงพยาบาลรัฐสังกัดอื่น เช่น โรงพยาบาลมหาวิทยาลัย ศูนย์แพทย์ กทม.
- ⁵ คลินิกทันตกรรมเอกชน
- ⁶ โรงพยาบาลเอกชน
- ⁷ หน่วยเคลื่อนที่ที่มีทันตแพทย์หรือทันตบุคลากรจากหน่วยงานของรัฐ
- ⁸ อื่นๆระบุ
- ⇒ ในการรักษาทางทันตกรรมครั้งล่าสุด ท่านใช้สิทธิสวัสดิการสุขภาพของท่าน หรือไม่
- ⁰ ไม่ใช่ ⇒ ระบุเหตุผลที่ไม่ใช้สวัสดิการ (ตอบได้มากกว่า 1 ข้อ)
- ¹ ไม่มีสิทธิ ² ตวยาว
- ³ รอนาน ⁴ สิทธิที่ไม่มีครอบคลุมด้านทันตกรรม
- ¹ ใช่

ETHICAL APPROVAL FORM



No. 001/2019

Study Protocol and Consent Form Approval Certificate of Exemption

The Human Research Ethics Committee of the Faculty of Dentistry, Chulalongkorn University, Bangkok, Thailand has approved the following study to be carried out according to the protocol and patient/participant information sheet dated and/or amended as follows in compliance with the ICH/GCP

Study Title : Dental services utilization, oral status, and oral health-related quality of life among Thai elderly: data from the eight Thailand national oral health survey

Study Code : HREC-DCU 2019-002

Study Center : Chulalongkorn University

Principle Investigator : Mr. Punkanit Harirugsakul

Protocol Date : January 7, 2019

Date of Approval : January 11, 2019

Date of Expiration : January 10, 2021

(Associate Professor Dr. Kanokporn Bhalang)
Chairman of Ethics Committee
Associate Dean for Research

*A list of the Ethics Committee members (names and positions) present at the Ethics Committee meeting on the date of approval of this study has been attached (upon requested). This Study Protocol Approval Form will be forwarded to the Principal Investigator.

Approval is granted subject to the following conditions: (see back of the approval)

VITA

NAME PUNKANIT HARIRUGSAKUL

DATE OF BIRTH 6 OCT 1990

PLACE OF BIRTH BANGKOK

INSTITUTIONS ATTENDED WESTERN UNIVERSITY
CHULALONGKORN UNIVERSITY

HOME ADDRESS 696,698 THE LOG CORNER SUKHUMVIT 101/1 BANGJARK
PHRAKANONG BANGKOK 10260

