Association between Social Determinants and Prosthesis Obtained in Bangkok Elderly: 10 Years after Universal Coverage Policy Implementation

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Abstract

During these ten years, the number of elderly populations in Bangkok increases every year, and tooth loss is still a major oral problem in their daily life. The main treatment to solve this problem is to replace the edentulous ridge with a prosthesis. Many factors affected the elderly in Bangkok in obtaining the prosthesis. The financial situation is one of the factors, and the government has supported three main insurance systems as a solution. This study aims to investigate the associations between social determinants and prosthesis obtained by the elderly in Bangkok during these ten years after universal coverage policy implementation. The researcher analyzed the insurance usage information with the data obtained from two main surveys; the survey of the older people in Thailand (2007, 2014, and 2017) and the Thai National Oral Health Survey (2007, 2012, and 2017). The result showed that even the elderly in Bangkok receive prosthesis support from dental insurance; however, only less than half of them receive the prosthesis. There is still a big gap between the price that the insurance covers and the actual fee. Besides oral health insurance, other factors are the person whom elderly living with, the local public transportation, and the convenient access to dental clinics from home or resident that affect the prosthesis obtained process.

Keywords: *Prosthodontics, Decision Making, Oral Health Insurance, Universal coverage, Elders, Bangkok*

1. Introduction

According to the Elderly Act, B.E. 2546 (2003 A.D.) (Department of Older Persons, 2003), the definition of Thai elderly is people with Thai nationality whose ages are older than 60 years old. The world situation of the elderly has become a major complex problem in many countries due to the increasing rate of elderly numbers, decreasing fertility rate, and better in medicine and treatment, which leads to the extension of people's life expectancy. By many reviews, the number of elderly will be increasing every year, and in some countries, including Thailand, the number of the elderly is over the number of youth and adolescents (United Nations, 2016, 2019a, 2019b; United Nations Population Fund, 2012). UN - World Population Prospects 2015, reported that more than 900 million people or 12% of the global population are elderly (United Nations, 2015). Thailand also faces this situation. In 2017, Thailand got 10.2 million elderly. With this increasing rate, the number of the elderly will reach 21 million in 2050. Due to the Global burden of oral condition (Marcenes et al., 2013) and WHO Report (Kassebaum et al., 2014), they suggested in the same way that "tooth loss" is one of the major problems that affect the daily life and the quality of life (Klotz, Hassel, Schroder, Rammelsberg, & Zenthofer, 2017; Pallegedara & Ekanayake, 2008; Ribeiro, Campos, & Rodrigues Garcia, 2017; Wong & McMillan, 2005). Even though its prevalence and incidence of the tooth loss decreased in every survey, but the severity still increased (*The Challenge of Oral Disease – A call for global action. The Oral Health Atlas. 2nd ed.*, 2015). "**The survey of the older persons in Thailand**" was a survey taken by the National Statistical Office of Thailand to collect demographic, economic, social, health, support, and living characteristics of the elderly who live in Thailand. From this survey, there have been five formal reports since 1994, and the latest report was in 2017. This survey reported the numbers of elderly who worn dentures. "**Thai National Oral Health Survey**" is a survey by the Bureau of Dental Health about important epidemiological data of important oral diseases and factors affecting oral health conditions in all age groups and continuously reports every 5 years. The latest Thai National Oral Health Survey in 2018 (Bureau of

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Dental Health, 2018) showed that 8.7% of 60-74 years group and 31% of 80-85 years group have completely lost their teeth.

From the oral health survey, tooth loss was one of the age-related problems caused by number, location, and distribution (Chen M, 1997; Gerritsen, 2010; Gilbert, Meng, Duncan, & Shelton, 2004; Hobdell M, 2003; Käyser, 1981; Petersen & Yamamoto, 2005). After tooth loss, especially key tooth/teeth or many teeth, theoretically, it was recommended to be replaced by prosthesis to solve the problems such as improved facial esthetic (Persic & Celebić, 2014), improved or maintained oral function (Pillai et al., 2015), increased chewing ability (Persic & Celebić, 2014), helped in nutrition intake accuracy (Pillai et al., 2015; Wöstmann et al., 2008), as well as the quality of life (QoL) (Divaris, Lee, Baker, & Vann, 2011; Poljak-Guberina, 2005), it was a factor that related to it, even in the elderly who had an underlying disease or even bedridden (Klotz et al., 2017; Ribeiro et al., 2017). From the above, it can be noticed that tooth loss impaired quality of life, therefore it is very important to replace the edentulous area with a prosthesis (Gilbert et al., 2004; Joseph AG, 2016). Making a prosthesis is not only the treatment of tooth loss problem, but it also is a factor related to their QoL. There are two main types of prosthesis: fixed prosthesis and removable prosthesis. In this research, the researchers focus on only the removable prosthesis, which was covered by oral health insurance. There are three types of removable prostheses; Complete Denture (CD), Acrylic Removable Partial Denture (ARPD), and Metal Removable Partial Denture (MRPD).

WHO standard has suggested people have at least 20 natural teeth or at least four posterior occluding pairs which show better OHRQoL (Somsak & Kaewplung, 2013). Our previous study demonstrated that at least five teeth might be a significant clinical threshold for Thai elderly dental patients' quality of life (Somsak & Kaewplung, 2013). Other studies also mentioned that people who got higher remaining teeth and occluding teeth had better in QoL (McKenna et al., 2012; Park, Song, Han, Cho, & Kim, 2019). From the 4th-7th Thai National Oral Health Survey, it showed the rate of tooth loss in the elderly has declined. Nonetheless, it was still high, and only less than 26% of them got prosthesis.

There are three main government supportive schemes for oral health insurance; Social security scheme (SSS), Universal coverage scheme (UCS), and Civil servant medical benefit scheme (CSMBS). As we know, a prosthesis is important to the elderly OHRQoL. By the government policy for dental treatment, these insurances cover scaling, filling, extraction, and removable prosthesis. The maximum support of acrylic full mouth complete denture is 4,400 Baht per year while the coverage is 1,500 Baht per year for the acrylic removable partial denture with more than five teeth. The metal-based denture and fixed denture will be supported only by the Civil servant medical benefit scheme (CSMBS). In Thailand, the Health Insurance System was established to reduce disparities in public health services (Health Information System Development Office, 2016). SSS and UCS mainly cover employees in enterprises or people who apply to the scheme in a dental clinic (including clinic, hospital, and dental school) and those who attend in these schemes (84.02% of the elderly population in 2017 used these two schemes). On the other hand, CSMBS is specifically for civil servants, retired civil servants, state enterprises, independent state agencies, employees of local government organization in government dental clinics (14.67 % of the elderly population in 2017 use this scheme). In general, the supportive rate of each dental health insurance might not be enough to support the actual fee. The supportive rate of SSS and UCS cover only acrylic-based dentures (CD & ARPD) while CSMBS the covers extended to metal-based denture (MRPD). SSS and CSMBS cover the cost of prostheses, from 1,300 to 4,400 Baht and from 800 to 2,600 Baht per year respectively (depended on the type of prosthesis) while USC supports a pair of CD/ARPD every five years with no prognosis condition, not by the denture cost and the payment can be reimbursed only through the hospitals registered system (Table 1).

Table 1 Criteria of prosthesis support from government health insurance

Supporting rate	Complete Denture		Acrylic Removeable Partial Denture		Metal Removeable Partial Denture	
	Single arch	Both arch	1-5 teeth	>5 teeth	1-5 teeth	>5 teeth
SSS	2,400	4,400	1,300	1,500	Not available in scheme	
USC	1 pair every 5 years		1 pair every 5 years		Not available in scheme	
CSMBS	1,600	2,600	800	1,000	1,300	1,400

Remark: - Rate in Baht
*   - Data from Annual report of Social Security Office, National Health Security Office, and The Comptroller General's Department, Ministry of Finance*

2. Objectives

The objective of this study was to investigate the association between social determinants and prosthesis obtained among Bangkok elders during ten years after universal coverage policy implementation.

3. Materials and Methods

This research analyzed the data obtained from two major surveys; "**the survey of the older persons in Thailand**," which was taken by the National Statistical Office of Thailand in the year 2007, 2014, and 2017, and focused on elderly household residents in Thailand and "**the Thai National Oral Health Survey**," which was taken by Bureau of Dental Health, Ministry of Public Health in 2007, 2012, and 2017 and focused on the epidemiology of dental problems and influence factors of oral health. Besides, in the same year, the data of government health scheme from Health and Welfare Survey were taken by the National Statistical Office of Thailand. The dependent variables in this study were equality in obtaining prostheses by the Thai elderly. The study was approved by the research ethics committee (HREC-DCU 2018-074), Faculty of Dentistry, Chulalongkorn University. Meanwhile, the independent variable was proxies for/of social determinants such as geographic characteristics, social support and cohesion, social circumstance, underlying determinants, and other related factors. The associations of social determinants and prosthesis obtained among Thai elderly were analyzed using logistic regression.

4. Results and Discussion

From 2007 to 2017, Thailand's total population has increased from 63,038,247 to 66,188,503 or 5.00% of the population. In this number, the elderly have also increased from 7,020,959 to 10,225,322, which is 31.34% of the total population. Inside these numbers, Bangkok elderly population increased from 647,366 to 978,455 or increasing 331,089 people (33.84%). This elderly survey divided the elderly into three groups: 60-69, 70-79, and more than 80 years old. The % age of the elderly population in Bangkok as compared to the total Thailand population from 2007 to 2017 increased from 1.03% to 1.48%, and approximately 60% was in the range of 60 – 69 years old. (Table 2).

There are more social factors that affect the access to dental treatment such as elderly income or financial status, dental literacy, the dental treatment process (especially prosthodontic process which needs many visits to complete the work), distance from home, distribution of dental care providers, and local public transportation (Aida et al., 2016; Divaris et al., 2011; Petersen, Kandelman, Arpin, & Ogawa, 2010; Poljak-Guberina, 2005; Reddy, Reddy Na Fau - Narendra, Narendra R Fau - Reddy, & Reddy, 2005; Sabbah, Tsakos, Chandola, Sheiham, & Watt, 2007; Shah, Parkash, & Sunderam, 2004). Concerning relevant living factors, the number of elderly living with their child and grandchild has been increasing in every survey (Bureau of Dental Health, 2007, 2013, 2018) from 19.15% in 2007 to 61.80% in 2017. It showed a big change from 2007 when most of the elderly stayed alone or with their spouse. From the survey results, it can be noticed that most of them do not have any caregivers to look after their daily life activities. On the other hand, if they needed a caregiver, child and grandchild were their main caregiver (Thailand National Statistic Organization, 2014) (Figure 3). The most income of the elderly came from their child(ren) and working in the range of 100,000 –299,999 Baht per year in 2007 (Thailand National Statistic Organization, 2007). The said income decreased to 50,000 – 99,999 Baht per year in 2014 and 2017, but it showed a few differences between the

current and previous income range (Figure 1). Main sources of the elderly income in 2007 were from their family including spouse, child, parent, brother, sister, and relative, and then followed by working while 2014 and 2017 followed by government support allowance (social security fund and government living allowance) (Thailand National Statistic Organization, 2007, 2014, 2018). In the term of sufficiency, they felt that this amount of income was enough for living but the report showed decreasing from 57.5 to 67.4% in the years 2007 to 2017 and most of them needed no more working. The education of elderly was mostly in the level of lower than high school (Table 3).

Table 2 Population, Gender, and Age range

Topic	2007	2012	2014	2017
Thai population	63,038,247 (100%)	64,456,695 (100%)	65,124,716 (100%)	66,188,503 (100%)
Thai elderly population	7,020,959 (11.14%)	8,170,909 (12.68%)	9,110,754 (13.99%)	10,225,322 (15.45%)
Bangkok elderly population	647,366 (1.03%)	765,974 (1.19%)	942,586 (1.45%)	978,455 (1.48%)
Age: 60 – 69 years old in Bangkok	390,435 (60.31%)	No Data	560,182 (59.43%)	666,428 (68.11%)
Age: 70 – 79 years old in Bangkok	192,617 (29.75%)	No Data	263,596 (27.97%)	291,127 (29.75%)
Age: More than 80 years old in Bangkok	64,314 (9.93%)	No Data	118,808 (12.60%)	132,419 (13.53%)

Remark: Data from the nationally representative Thai elderly survey of 2007, 2014, and 2017

Table 3 Showed the Income, the financial situation and the educational level of the elderly in Bangkok

Topic	2007	2012	2014	2017
Source of income				
- Working	540,824	No Data	232,789	264,804
- Remuneration / Pension	108,968	No Data	133,673	139,350
- Government support	303,872	No Data	736,263	828,310
- Saving interest / Saving / Assets	554,000	No Data	676,933	550,414
- Family / Relative	2,843,658	No Data	932,862	1,063,126
- Others	28,876	No Data	10,221	12,629
Income sufficiency				
- Yes	509,074	No Data	664,326	734,717
- Somewhat	66,685	No Data	152,764	163,457
- No	71,607	No Data	125,496	191,801
Working requirement				
- Yes	142,467	No Data	156,081	193,458
- No	504,899	No Data	423,639	896,516
Education				
- No and Unknown	87,643	No Data	71,685	94,511
- Lower than high school	337,861	No Data	624,243	623,266
- High school to under bachelor	82,841	No Data	147,816	179,737
- Bachelor's degree	77,848	No Data	129,155	155,165
- Higher than bachelor's degree	61,173	No Data	37,462	37,295
- Other education		No Data	1,147	No Data

Remark: Data from the nationally representative Thai elderly survey of 2007, 2014, and 2017
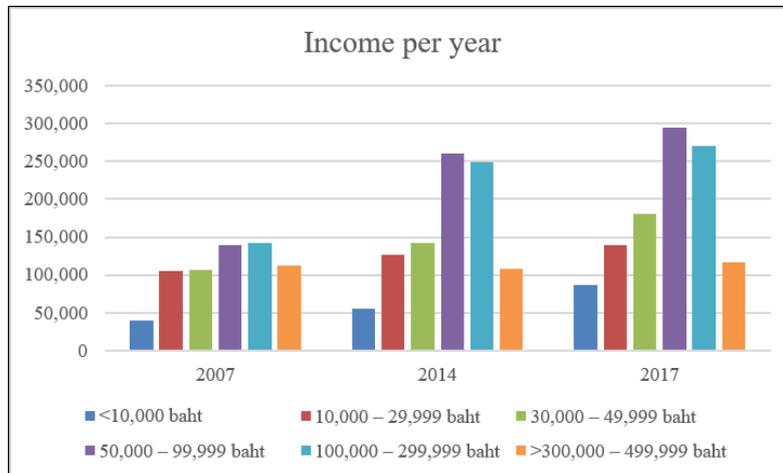
Figure 1 Income per year of Bangkok elderly (Thailand National Statistic Organization, 2007, 2014, 2018)
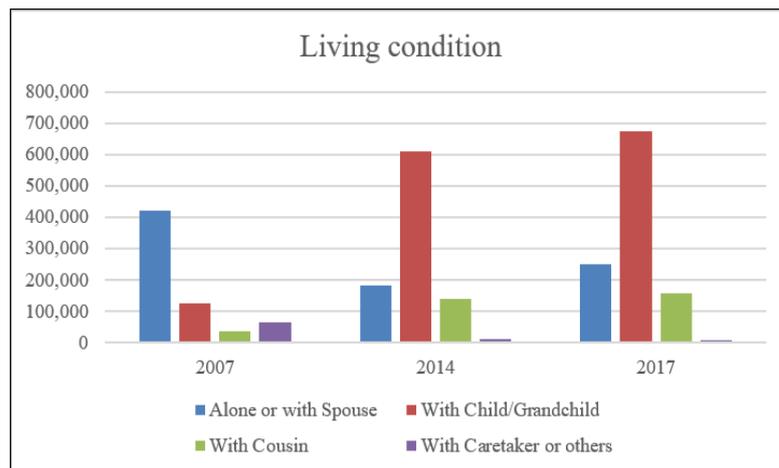

Figure 2 Living condition of Bangkok elderly (Thailand National Statistic Organization, 2007, 2014, 2018)
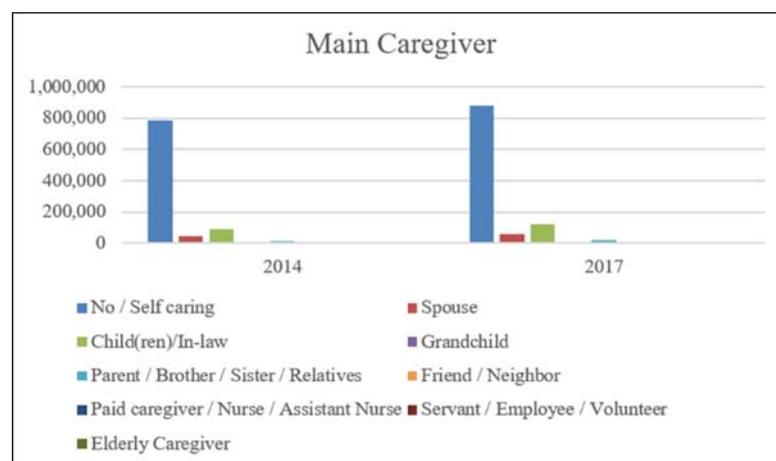
**Figure 3** Main caregiver of Bangkok elderly (Thailand National Statistic Organization, 2014, 2018)

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Next, oral conditions (Table 5), in the 6th National Dental Survey (2007) found that elderly in the age range 60 – 74 years old who had four occluding teeth was 76.7% while a complete loss was 6.7% of the sample. The%age of 4 occluding teeth decreased to 37.5% and showed 64.3% of 60 – 74 years old elderly who had 20 teeth with four occluding teeth in the 7th National Dental Survey (2012). They also showed a higher%age in the complete loss of their teeth. Moreover, a prosthesis needs of the elderly in the 8th National Dental Survey (2017) decreased from the 7th National Dental Survey (2014) and increased in prosthesis obtained. According to the two latest reports of elderly in Thailand (2014 & 2017), the demand for the prosthesis in the elderly increased tremendously; from 3.45 to 45.13% in 2017. The rise of the demand might drive from a collaboration of the Denture and Oral Health Promotion and Prevention projects and USC in 2015, which offered a free pair of acrylic-based dentures to the elderly.

According to the government health scheme in 2007 and 2017, the number of Bangkok population who used the Government Health scheme for dental health services in the last time has changed. In 2007 and 2017, 10.67% and 30.05% of the population used their rights under SSS and followed by CSMBS, which was 8.83% and 8.15%, respectively (Table 4).

Table 4 Number of Bangkok populations getting dental health service in the past 12 months before the date of interview by using health insurance for the last time in 2007 and 2017 (person)

Health scheme used (Thailand)	2007	2017
Universal Coverage Scheme (UCS)	47,441 (4.95%)	52,328 (3.95%)
Social Security Scheme (SSS)	102,378 (10.67%)	398,347 (30.05%)
Civil Servant Medical Benefit Scheme (CSMBS)	84,695 (8.83%)	108,054 (8.15%)

Remark: Data from the report of the health and welfare survey (2007 and 2017)

Table 5 Oral condition of Elderly in Bangkok

Topic (% of sample)	2007	2012	2014	2017
4 Occluding teeth (60-74 y/o)	76.7	37.5	Not Survey	36.9
20 teeth	No Data	58.3	Not Survey	49.0
20 teeth with 4 occluding teeth: 60 - 74 years old	No Data	64.3	Not Survey	36.0
20 teeth with 4 occluding teeth: 80 - 85 years old	No Data	Not Survey	Not Survey	11.5
Complete tooth loss	6.7	10.8	Not Survey	8.9
Apply prosthesis: Yes	No Data	Not Survey	32,526 (3.45%)	491,944 (45.13%)
Apply prosthesis: No	No Data	Not Survey	902,509 (95.75%)	593,661 (54.47%)
Apply prosthesis: Unknown	No Data	Not Survey	7,551 (0.80%)	4,369 (0.40%)

Remark: Data from the survey of the older persons in Thailand (2007, 2014, 2017) and the Thai National Oral Health Survey (2007, 2012, 2017)

Each government health scheme has different conditions and supportive rate for prostheses. As mentioned above, the supportive rate of SSS and UCS cover only acrylic-based dentures (CD & ARPD) while CSMBS covers extended to metal-based dentures (MRPD). SSS and CSMBS cover the cost of prostheses in the range of 1,300 to 4,400 Baht and 800 to 2,600 Baht per year respectively which depend on the type of prosthesis while USC supports a pair of CD/ARPD every five years with no prognosis condition, not by the denture cost and the payment can be reimbursed only through the hospitals registered system (Table 1). In Table 6, the data showed the prosthesis price of various dental services in different locations in Bangkok. The price in dental universities was lower than government / private hospitals and clinics, and the price in government / private hospitals and clinics in the center of Bangkok was the most expensive. The government health schemes opened for private dental services to participate. Because the supportive rate of government health schemes might not cover all actual fees in some government or private dental services, the elderly would pay the difference.

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The number of participated dental practices is one of the important factors for the elderly to access the service. Only 553 clinics in Bangkok participate the government health schemes. SSS has started the support of prosthesis since 2014 and has 383 clinics of private and government sectors that attended this scheme. There are 122, and 48 clinics attended USC and CSMBS, respectively (National Health Security Office, 2017; Social Security Office, 2017).

Table 6 Prosthesis price in Bangkok (Baht)

Prosthesis Cost	Complete Denture	Acrylic Removable Partial Denture	Metal Removable Partial Denture
Government hospital: In Government time	8,000	2,000 – 3,000	5,500 – 7,500
Government hospital: Non-Government time	17,000	2,500 – 7,000	7,000 – 12,000
Private hospital: Outside center Bangkok	12,000 – 20,000	Start 1,500 – 2,500	Start 5,500 – 9,000
Private hospital: Center Bangkok	20,000 – 25,000	5,000 – 6,000	13,000 – 22,000
Private clinic: Outside center Bangkok	8,000 – 15,000	Start 1,500 – 2,500	Start 5,000 – 9,000
Private clinic: Center Bangkok	20,000 – 50,000	4,500 – 8,000	12,000 – 18,000
Dental university: Undergraduate student	1,500 – 3,000	800 – 1,500	1,000 – 2,500
Dental university: Postgraduate student	3,000 – 7,500	800 – 2,400	2,000 – 6,000
Dental university: Special clinic	13,000 – 15,000	1,800 – 7,000	5,000 – 13,000

Remark: Data from the private dental clinic in Bangkok and dental school of Chulalongkorn University

Not only the number of participated dental practices but also the convenient transportation to dental practices for the elderly to get the services are also one of the important factors. Transportation by private car with the caregiver is the most convenient. If a caregiver cannot travel with the elderly, public local transportation is the major choice for the elderly to bring them to get services in dental practices. In Bangkok, there are five public local transportations; Bus, Train, BTS (Bangkok Transit System), MRT (Metropolitan Rapid Transit) and ARL (Airport Rail Link) that partially cover some areas in Bangkok. BTS, MRT, ARL are faster and more convenient but more expensive and do not cover all areas of Bangkok. These local public transportations are going on expansion within a few years and suitable for independent elderly. On the other hand, the dependent elderly who were limited in traveling will be very difficult to travel by themselves.

From the review, it can be seen that the % age of the elderly population in Bangkok has not changed considerably. The change was seen in each age range. The children play as the main role in their life activities; main caregiver, people whom the elderly living with, and main source of income. The elderly got lower in average income per year, but it did not change their sufficiency.

From the oral condition of Bangkok elderly (Table 5), the tooth loss (the remained teeth were lower than four occluding teeth and complete tooth loss) in elderly slightly decreased but the trend of prosthesis replacement on the edentulous area is obviously increased from the previous survey (Thai elderly's survey and the Thai National Oral Health Survey). The reason might from the additional supportive fee from SSS in partial acrylic denture was a driver to increase prosthesis obtained from 2014 to 2017.

There is a tendency for Bangkok elderly to get the benefits from USC as their main health and dental insurance but the data showed that almost 50% of them receive prostheses while the rest had not taken these benefits. (Table 5). Among the three main prostheses supporting the scheme, USC does not support the fee but supports a pair of prostheses every five years. Therefore, Table 7 compared the prosthesis cost after deducting the supportive fee of SSS and CSMBS to show a clear view of the cost which the elderly would pay if they got the treatment from each dental facility under government health scheme. The government supportive insurance covers a minimum of 8.8% (Private clinic in the center of Bangkok) and a maximum of 100% (Dental University with undergraduate student) of the treatment cost. The treatment cost in dental school (treated by the dental student) and government hospital can be covered by the government health scheme. If the elderly choose to get the service from other facilities, the difference will be their responsibility. Even though there are many private dental clinics and hospitals attended to the government supporting schemes, most of them are in commercial, prime or business areas of Bangkok while the elderly distributes all over Bangkok. The limited access of local public transportation from their homes to dental facilities is one

of the major obstacles for the insufficient income and dependency elderly that make them time consumption and expensive.

Table 7 Different between prosthesis cost and supportive prosthesis cost from government scheme (Baht)

Prosthesis Cost	Complete Denture		Acrylic Removable Partial Denture		Metal Removable Partial Denture
	SSS	CSMBS	SSS	CSMBS	CSMBS
Government hospital: In Government time	3,600 - 5,600	5,400 - 6,400	500 - 1,500	1,200 - 2,000	4,300 - 6,200
Government hospital: Non-Government time	12,600 - 14,600	14,400 - 15,400	1,000 - 5,500	1,700 - 6,000	5,600 - 10,700
Private hospital: Outside center Bangkok	7,600 - 17,600		0 - 1,000		
Private hospital: Center Bangkok	15,600 - 22,600	Not support in private clinic.	3,500 - 4,500	Not support in private clinic.	Not support in private clinic.
Private clinic: Outside center Bangkok	3,600 - 12,600		0 - 1,000		
Private clinic: Center Bangkok	15,600 - 47,600		3,000 - 6,500		
Dental university: Undergraduate student	No difference	0 to 400	No difference	0 - 500	0 - 1,100
Dental university: Postgraduate student	1,000 - 3,100	0 to 4,900	0 - 900	0 - 1,400	700 - 4,600
Dental university: Special clinic	At least 10,600	11,400 - 12,400	300 - 5,500	1,000 - 6,000	3,700 - 11,600

Remark: - Data from the private dental clinic in Bangkok and the dental school of Chulalongkorn University.
- USC did not support by prosthesis fee.
- SSS and USC did not support the metal removable partial denture.

Not only environmental factors but literacy is also one important factor. The lack of proper dental literacy makes the elderly lose their teeth. When they had dental problems, such as toothache or tooth mobility, they chose to extract and no replacement. They believed that the remaining teeth could replace the function of the loss. The delayed disbursement process is one factor causing the elderly to not be interested in participating or using even they have the right. The limitation of this study was the survey data came from different hypotheses and periods. They might not be matched and analyzed in the same aspects. The information of Bangkok elderly in each scheme or dental facility are separated and difficult to and integrate them for analysis. Even though the number of private clinics and private hospitals that easy to access by the elderly is high, the researchers cannot get data from them. If the researchers have enough data from all sections, the researchers will get precise information to identify the exact problems and create the proper solutions.

5. Conclusion

Concerning an association between social determinants and prosthesis obtained by the elderly in Bangkok after 10-year implementation of universal coverage policy, it can be concluded that the elderly in Bangkok, whose some of their living conditions and environmental factors have changed, are related to the prosthesis obtained especially in the factors related and affecting income. The Government is still working on facilitating the assessment of dental care (including receiving prostheses) and oral health promotion on the elderly in Bangkok. Private dental clinics are the easiest to access; however, most of them are lacking government support. In contrast, government hospitals and dental schools that receive high government support are more difficult to access since it located only in central of Bangkok. It can be seen that there are

more factors that need improvement. Even though the government has already supported them by three main government supportive health insurance and more convenient assessment, the elderly still have to pay a high amount of additional cost to visit the clinic for complete prosthodontic treatment.

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