NON-DENTIST DENTURE SERVICES UTILIZATION IN THAILAND: RELATED FACTORS AND OUTCOMES

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การใช้บริการใส่ฟันเทียมจากบุคคลผู้ไม่ใช่ทันตแพทย์:ปัจจัยที่เกี่ยวข้องและผลลัพธ์

นายปกรณ์ จิตรกฤษฎากุล

วิทยานิพนธ์นี้เป็นส่วนหนึ่งของการศึกษาตามหลักสูตรปริญญาวิทยาศาสตรดุษฎีบัณฑิต
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ปกรณ์ จิตรกฤษฎากุล : การใช้บริการใส่ฟันเทียมจากบุคคลผู้ไม่ใช่ทันตแพทย์:ปัจจัยที่เกี่ยวข้องและผลลัพธ์ (NON-DENTIST DENTURE SERVICES UTILIZATION IN THAILAND: RELATED FACTORS AND OUTCOMES) อ.ที่ปรึกษาวิทยานิพนธ์หลัก: ผศ. ทพ. ดร.เทวฤทธิ์ สมโคตร, 135 หน้า.

สาเหตุจากทันตแพทย์ไม่สามารถตอบสนองความต้องการใส่ฟันเทียมได้ ประชาชนคนไทยจึงใช้บริการใส่ฟันเทียมจากบุคคลผู้ไม่ใช่ทันตแพทย์ โดยมีการรายงานคำบ่นเกี่ยวกับบริการฟันเทียมที่ได้รับจากบุคคลผู้ไม่ใช่ทันตแพทย์เป็นระยะ ได้แก่ มีการอักเสบของเนื้อเยื่อ บวม ปวดเวลาเคี้ยวอาหาร และมีกลิ่นไม่ดีจากฟันเทียม วัตถุประสงค์ของงานวิจัยนี้ เพื่อประเมินความแตกต่างของลักษณะทางประชากรและผลลัพธ์ของการบริการใส่ฟันเทียมระหว่างทันตแพทย์และบุคคลผู้ไม่ใช่ทันตแพทย์ โดยทำการศึกษาในกลุ่มทดลองซึ่งรับบริการจากบุคคลผู้ไม่ใช่ทันตแพทย์ 165 คน และกลุ่มควบคุมซึ่งรับบริการจากทันตแพทย์ 688 คน จับคู่ด้วย เพศ การศึกษา การทำงานและประกันสุขภาพ กลุ่มตัวอย่างใช้งานฟันเทียมไม่นานเกิน 2 ปี มาจาก 4 จังหวัดในประเทศไทย กลุ่มควบคุมสุ่มจากโรงพยาบาลหรือคลินิกทันตแพทย์เอกชน กลุ่มทดลองสุ่มจากชุมชน โดยมีผู้สัมภาษณ์ 1 คนและผู้ตรวจเก็บข้อมูล 1 คน กลุ่มตัวอย่างจะถูกถามเกี่ยวกับลักษณะทางเศรษฐานะสังคมประชากรศาสตร์ แหล่งข้อมูลและข้อมูลที่ได้เกี่ยวกับผู้ให้บริการ สาเหตุที่ใส่ฟันเทียมและสาเหตุที่เลือกผู้ให้บริการ ลักษณะการให้บริการ และให้คะแนนความพึงพอใจในชิ้นงานฟันเทียมและการบริการ มีการประเมินชิ้นงานฟันเทียมและตรวจช่องปาก จากผลการวิจัย พบว่าปัจจัยที่มีผลให้เลือกใช้บริการใส่ฟันเทียมจากบุคคลผู้ไม่ใช่ทันตแพทย์ ได้แก่ การอยู่อาศัยนอกเขตเทศบาล การใช้บริการเคลื่อนที่สำหรับใส่ฟันเทียม การได้รับข้อมูลโดยตรงจากผู้ให้บริการใส่ฟันเทียมซึ่งไม่ใช่ทันตแทย์ การรับรู้ว่ามีบริการใส่ฟันเทียมใกล้ๆบ้าน การยินยอมที่จะชำระค่าบริการใส่ฟันเทียม และการเลือกผู้ให้บริการเพราะใช้เวลาน้อยในการใส่ฟันเทียม ส่วนผลลัพธ์การบริการ พบว่า ผู้ใช้บริการพอใจในการและชิ้นงานฟันเทียมของทันตแพทย์มากกว่าการบริการของบุคคลผู้ไม่ใช่ทันตแพทย์ ฟันเทียมบางส่วนที่ทำโดยทันตแพทย์มีลักษณะที่ยอมรับได้มากกว่าในทุกด้าน สรุปผลงานวิจัย แม้ว่าฟันเทียมที่ทำโดยบุคคลที่ไม่ใช่ทันตแพทย์จะแย่กว่าทันตแพทย์และต้องเสียค่าใช้จ่ายในการทำแต่ก็ยังมีผู้ไปใช้บริการ เนื่องจากสถานบริการของรัฐไม่สะดวกสบายในการใช้บริการ เพื่อแก้ไขปัญหาดังกล่าว ควรมีการจัดสรรทรัพยากรด้านทันตสาธารณสุขให้เหมาะสม ปรับลดระยะเวลารอคอย ปรับลดระยะเวลาในการทำฟันเทียม และจัดบริการฟันเทียมที่สามารถเข้าถึงให้มากขึ้น

ภาควิชา ทันตกรรมชุมชน ลายมือชื่อนิสิต .....

สาขาวิชา ทันตสาธารณสุข ลายมือชื่อ อ.ที่ปรึกษาหลัก .....

ปีการศึกษา 2558

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KEYWORDS: DENTURE, NON-DENTIST, NON-PROFESSIONAL TECHNIQUE, DENTURISM, STREET DENTIST

PAKORN JITKITSADAKUL: NON-DENTIST DENTURE SERVICES UTILIZATION IN THAILAND: RELATED FACTORS AND OUTCOMES. ADVISOR: ASST. PROF. TEWARIT SOMKOTRA, D.D.S.,Ph.D., 135 pp.

Background: Unmet denture demand from dentists led denture wearers to seek denture service from non-dentist (ND). Reported complaints about obtained denture service from ND are inflammation, swelling, pain on chewing, and bad odor. Objective: To assess differences in population characteristics and outcomes between ND and dentist denture service users. Materials and methods: 165 cases obtained denture from ND and 688 controls from dentist were matched with sex, educational level attainment, work status, and health insurance. All had been using dentures for not more than 2 years. Participants were recruited from four provinces. Controls were from hospitals or private practices, while cases were from community areas. Data were collected by one interviewer and one examiner. Participants were asked of socio-eco-demographic characteristics, reasons to obtain recent denture and reasons for choosing this denture provider, denture service characteristics, and rated their denture service and denture satisfactions. Dentures were assessed and oral cavity was examined. Results: Population characteristics : the following factors are more likely to be associated with obtaining denture from ND than from dentist: living in non-municipal area, utilizing mobile-service, knowing information directly from provider, perceiving that served nearby accommodation, accepting out-of–pocket payments for denture, and choosing ND provider because short denture –fabricating period. For outcomes: Denture wearers satisfied on denture and denture service from dentist more than ND. Partial denture fabricated by dentist has more acceptable aspects than ND. Conclusion: Even dentures fabricated by ND are worse than dentist and not free of charge though denture wearers still utilized ND denture service because of inconvenience of public facilities. To solve this problem, Thailand has to reallocate dental resources, shortening denture queue and denture fabricating procedure, and provide more easy-to-access public facilities.

Department: Community Dentistry Student's Signature .....
Field of Study: Dental Public Health Advisor's Signature .....
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CHAPTER I

INTRODUCTION

1.1 Background and Rationale

Unmet denture demand from dentists led denture wearers to seek another denture service from new denture provider group known as non-dentist (ND). This group existed since 17th century BC (Hillam, ed., 1990; Harris, 2007). In the emergence of the dental professional, the other denture provider groups were classified as ND group and became dental quacks automatically. Nonetheless ND denture provider in some country finally was qualified and legally delivered denture to denture wearers directly which will be illustrated in review literature chapter. However, the problem associated with ND services is unhygienic process, non-steriled techniques, and non-professional techniques which were reported in several countries both developed and developing countries such as USA (Worldental.org, 2012), UK (Wilkes, 2012), Ireland (Consumers' Association of Ireland, 2016: Online), New Zealand (Sandra Conchie, 2012), Cuba (Almarales, 2013: Online), Trinidad (Naidu, Gobin and Newton, 2003), India (Sandesh and Mohapatra, 2009), Guyana (Benzian, Jean and van Palenstein, 2010), Hong Kong (University of Hong Kong, 1996), Taiwan (Moore and Shiau, 1999), China (Malherbe, 2011), Pakistan (Abbasi 2012), Sri Lanka (Ekanayaka and Samarasinghe, 1989) and also Thailand (ASTV Manager online, 2011: Online. Services of dental quacks were not only limited to denture services but they also do tooth filling, tooth removal, tooth bleaching and fashionable bracing also (Suphaluk Lertmanorut, 2005; ASTV Manager online, 2006: Online).

In Thailand, ND denture provider was not qualified and illegally delivered denture. Illegal ND denture services were found in every region of Thailand and they served in both non-mobile service at ND's house (ASTV Manager online, 2006, 2011:

Online) and mobile service at denture wearers' accommodation or market (Svati, 2007; Mor funThai dan, 2007: Online). Quality of ND denture services was questionable. There are different viewpoints among denture wearers, mass media and dentist. In perspective of denture wearer, ND denture had advantages such as it is cheaper than dentist, negotiable price, shorter time consuming for denture making procedure and length of waiting list (Suphaluk Lertmanorut, 2005; Svasti, 2007; ASTV Manager online, 2006: Online). These were supported by the mass media it is said that ND denture provider was "supporters of the poor" (Suphaluk Lertmanorut, 2005) in which some of them compromised denture fee for poorer (ASTV Manager online, 2006: Online) and eventually give denture with free of charge for indigent (Svasti, 2007). Nevertheless in the perspective of dentist: ND denture wearers always came to see them because of denture problems (Mor fun Thai dan, 2007: Story from pharmacist, 2010; Udonthani, 2011: Online). Denture delivery process is more complicated than denture making process in laboratory and need more clinical skill so it must be done by qualified dentist in proper workplace.

Moreover the socio-economic-related inequality among Thai elderly exists after UC implementation. Even Thailand succeeded in universal coverage scheme implementation though Thai elderly with lower socioeconomic status has higher rate of utilization on public facilities. Pro-rich tends to utilize private facilities because of inconvenience on public services and affordability for out-of-pocket payment. Nonetheless wealthier elderly uses more prosthetic service in government hospital (Somkotra, 2010; 2013). Further investigation about quality of dental care based on the type of provider should be carry on.

Solutions for ND illegal dental services utilization had several approaches such as increase incentives of legal dental provider, strengthen legislation and reduce barriers to use dental services (Naidu, Gobin and Newton, 2003; Bensian, Jean and van Palenstein Helderman, 2010). Thailand has been dealing the situation in the

same way by increasing incentives of dentists in rural areas, educating denture wearer about low quality and risk of ND denture service, and enforcing the professional regulation by launching of Dental Profession Act A.D.1994 and Medical Facilities Act A.D.1998 enforced ND denture provider were illegal for serving denture straight to people (ASTV Manager online, 2009, 2011; Story from pharmacist, 2010: Online). Despite ND denture services are illegal and health organizations warned about problems or hazards on denture, denture wearers still utilize ND denture services.

There are only two academic studies showing the factors that influence the illegal ND denture services utilization in Thailand which are lack of surveillance and information. It is very essential for this dissertation to identify factors influencing ND denture service utilization to find out suitable solution in future.

1.2 Research question

1.2.1 What are population characteristics (underlining determinant) associated with the use of non-dentist denture service among Thai denture wearers?

1.2.2 What are the differences of denture service characteristics and their effects between dentist and non-dentist denture wearers?

1.3 Research objective

1.3.1 To determine population characteristics (underlining determinant) associated with the use of non-dentist denture service among Thai denture wearers

1.3.2 To assess the differences of denture service characteristics and their effects between dentist and non-dentist denture wearers

1.4 Hypothesis

1.4.1 There are not underlying determinants associated with the use of non-dentist denture service among Thai denture wearers .

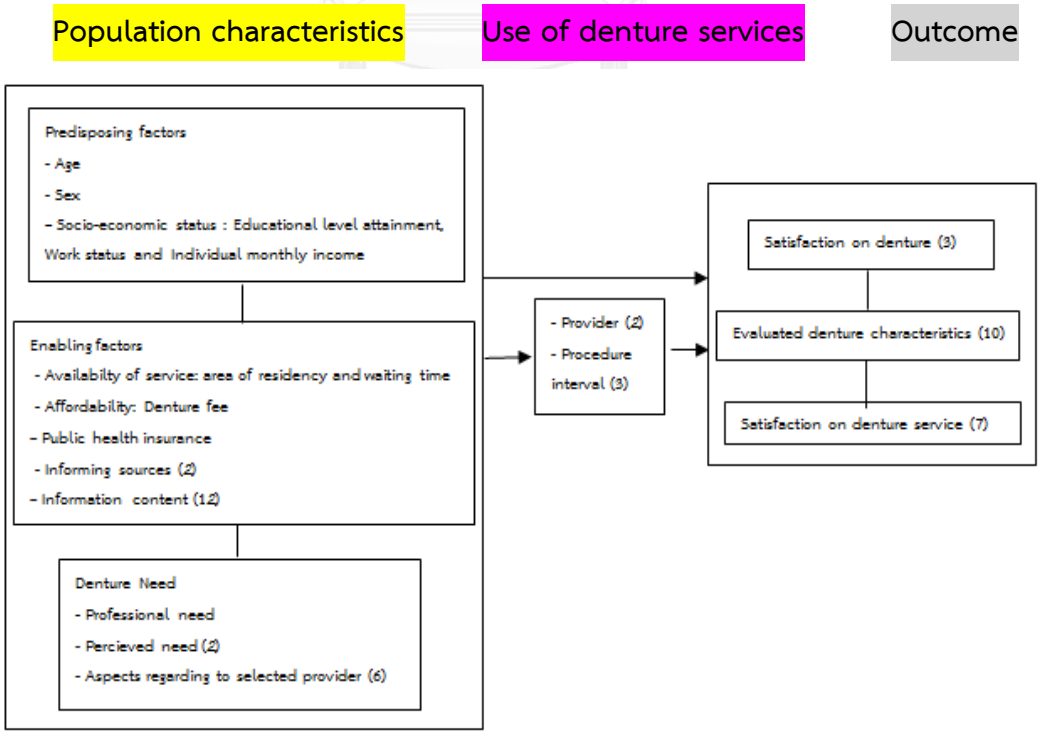
1.4.2 There are not differences between non-dentist and dentist denture wearers across denture service characteristics and their effects

1.5 Operational Definitions

Non-dentist: A person who did not qualify as dentist but provide dental service including denture service.

Removable denture: Denture which can be removed by denture wearers themselves but sometimes retained in position with non-professional technique so they cannot remove by themselves.

1.6 Conceptual framework



1.7 Scope of the Research

1.7.1 Population

Denture wearers in Thailand

1.7.2 Study population

Cases: Denture wearers obtained removable denture from ND denture provider

Controls: Denture wearers obtained removable denture from dentist

Samples were recruited from voluntary provinces of Thailand.

1.7.3 Variables

Independent variables: Age, sex, education, work status, individual monthly income, denture fee, waiting time, public health insurance, information source, information content, Professional need, perceived need and aspects regarding to selected provider.

Dependent variables: Provider and procedure interval which are correlated with denture status, denture wearer satisfaction on denture and denture service.

1.8 Research Design

Observational, Analytical, Case-Control study

1.9 Limitations of the Research

There is not previous study investigating ND denture service usage on any formal health service seeking model. Even Suphaluk (2005) described ground theory in Thailand and Pimpa (2013) explored the prevalence of ND denture usage in one sub-district though data are not enough to describe the direct dependencies on the set of variables with path analysis. Nevertheless this study will be the secondary data for further causal modeling investigation.

1.10 Ethical Considerations

The study protocol was approved by the Research Ethics committees of Faculty of Dentistry, Chulalongkorn University (HREC-DCU 2013-26)

1.11 Expected benefits and application

- To prevent the adverse effects among Thai denture wearers with risk approach

- To develop of knowledge from the findings and to create surveillance system for non-dentist service

1.12 Keywords

Denture, non-dentist, non-professional technique, denturism, street dentist

CHAPTER II

REVIEW OF LITERATURE

This chapter reviews the original of ND and factors related to ND denture service utilization. The chapter begins with the history of ND denture provider then describes ND denture provider around the world. Later part of the chapter illustrates the picture of ND denture service in Thailand, the deficiency of dental workforce, the emergence of ND denture provider and involved government policy. Lastly, factors related with ND denture service utilization were reviewed.

2.1 History of non-dentist denture provider

Denture provider is interesting occupation for the reason of high income returns when denture wearers get their dentures. From past to present, many occupation such lay practitioners have swopped themselves to be denture supplier and there are many changes in this occupation for denture demand, social condition and qualification reasons (Hilam, ed., 1990). The significant cutting point was legislating dental professionals which monopolized only dentist profession to be able to provide denture straight to people so denture supplier can be classified into four groups depending on job descriptions or legal right.

2.1.1 Former Denture Provider before Dentist Registration

The former denture provider group would fabricate and deliver denture to people by themselves. The skill in making denture was acquired from individual's basic handicraft skill and learnt from surrounding as below:

In 17th century BC, Etruscans; bronze expertise; settled in northern Italy; now call Tuscany. They created narrow strips of high flexible, very pure gold to splint loose teeth together or ligature false teeth; from ox, ivory or human teeth (Hillam,

1990; Harris, 2007); to adjacent teeth for replacing edentulous area due to aesthetic problem. On other part of the world, in the 14th century, Nakaoka Tei; a Buddhist priestess known as Hotokehime or Lady of Buddha in the Ganjyoji temple in Kii Province carved a wooden complete denture from cherry wood for herself (Gonzalez and Kuri, 2001). Skilled carpenter used wooden dentures until the Meiji period in 1868-1962. By the way, competent craftsmen during the reigned period of Louis XIV, extravagant and luxurious life style era of Europe in 1643-1715, prepared themselves to serve suddenly the denture demand of Parisians. In that period, the young and elegant smile meant no large spacing or many decayed tooth in the mouth so competent craftsmen would decorate their mouth with denture made from gold, crafted ivory, porcelain or combination (Hillam, ed., 1990).

In seventeenth century, some goldsmiths expanded their job from only manufacture denture in laboratory to provide denture to denture wearer directly also. This was an example of advertisements from the London press in the end of 17th century posted by them: 'Mr. Pilleau a French Goldsmith living in St Martin's Jane..... does give Notice, that by an experiences of 18 Years, he has found a way to make and set Artificial Teeth efficiently, that one may chew with them,... Any Operator for the Teeth may buy some ready made from him.' One year later, Pilleau's advertisement had changed; there was no offer about the denture producing service for any operator again therefore this could be assume that he provided denture by himself directly to clients (Hillam, ed., 1990).

The second denture supplier group would not manufacture denture in the laboratory, they would only manipulate with denture wearer and send the dental arch replica to technician for creating denture and return the denture for fitting to denture wearer by their own. This second group included these occupations:

'Operator for the teeth', in mid seventeenth century, is a person who was mentioned in an English contemporary dictionary as 'one skilled in drawing teeth

and in making artificial ones'. The early operators would work with client then give a instructions to a goldsmith for manufacturing metalwork for their prostheses and finally insert to denture wearer by operators (Hillam, ed., 1990).

'Dentist", in the late 1750s, is called to a person who is interested in dental matters including denture. At that time, dental treatment was a sideline of wigmakers, barbers, silversmiths, blacksmiths, apothecaries, dental treatment knowledge was learned from practicing by themselves, from father to son, (Gelbier, 2005) or gathered from tips in competitor's advertisements. This was the main route to enter early dental occupation. Even some experienced dentist offered apprentice; four or five years training; however there were not more than half trained for apprenticeship because of no professional body qualification or legislation. Increment of dentist in middle of nineteenth century mainly came from chemists or druggists who were members of dental dynasties and had to take care of their own family's dental business. This line of dental business made high income from fashionable dentistry and induced some low ethical methods by incompetent dentists. At that time, there were no qualification of dental service and professionalism (Hillam, ed., 1990).

By the way, there were efforts to gather the knowledge of dentistry from 1500's. *The little Medicinal Book for All Kinds of Diseases and Infermities of the Teeth* is the first book written by Artzney Buchlein and in 1723 (Hillam, ed., 1990), Pierre Fauchard published *Le Chirurgien Dentiste, ou traite desdents Dentist; Or treatise on the teeth* in English name. The second book introduced that dentistry was scientific and could be practicable in a specific way (Garant, 2013). These were the developing pathway of modern dentistry including qualification of dental service.

2.1.2 Legislating Dentist Professionals

To qualify the dental service and professionalism, dentist profession had to be a true profession. “A true profession is built upon a tripod: a formal organization, formal professional education, and a formal scientific literature. The United States was the leader in all three. In 1839-40, the American Society of Dental Surgeons was organized, the Baltimore College of Dental Surgery was established, and the first dental journal in the world, the American Journal of Dental Science, was founded.” (Ring, 2005).

Similarly, Royal College of Surgeons of England in 1858 granted a license in Dental Surgery for dentist professionalism. The Dentists Act 0f 1878 was set to qualified dentist for registration and the General Medical Council in 1879 implemented that only registered man could call himself ‘dentist’ or ‘dental surgoen’ hence an unregistered dental worker had no legal right to provide dental practice including denture service. The registration encouraged new comers to take course in a dental academic institute and to prepare themselves for securing license. The right to provide dental treatment of registered dentist reaffirmed with the resultant Dentists Act 1921. The Dentists register of United Kingdom nowadays is the responsibility of the Dental Board under the General Dental Council (Gelbier, 2005).

The legislation of dentist professionals is the formal formula all over the world to reduce the chances of adverse effects, and increases the quality of oral health care. Cruess et al in 2000 implied that “Being part of a profession entails a social contract. The profession is granted a monopoly over the use of a body of knowledge and the privilege of self-regulation and, in return, guarantees society professional competence, integrity and the provision of altruistic service.”(Cruess, Johnston and Cruess, 2002) Professions however always come with no competition in free market and insufficient services in some parts of society (Cruess, Cruess, and Johnston and, 2000)

2.1.3 Denture Provider after Dentist Registration

Dentist is *the third denture provider group* whom can work with people legally. They would only deal with people and prescribed dental laboratory to build dentures. Dentist registration enforced every dental practitioner has to pass the qualification and the step of denture treatment process which contact directly to denture wearer must be done by dentist. It is illegal for person who is not register as dentist such as dental laboratory technician, former denture provider learning from dental dynasty and previous self-learning denture provider to deliver denture straight to people. Although the dental practice of former denture provider without qualification by dental professional board will be considered as dental quackery or fraud and they have been renamed to dental quacks (Naidu, Gobin, and Newton, 1996), street dentists and charlatans (Sandesh and Mohapatra, 2009), trade dentists (Moore and Shiau, 1999), street denturists (Suphaluk Lertmanorut, 2005) or streetside dentise (Fernquest, 2007) etc.

However, the response on the legality on approaching client from other former denture provider did not show on the stage except dental laboratory technician. Some dental laboratory technicians did not agree with the scope of their occupation: only create denture in laboratory but cannot deliver to denture wearer, and try to sanction this. In 1843, a Danish dental laboratory technician successfully approved himself to practice not be illegal to provide service directly to denture wearer under a specific judicial proclamation (Boxhall, 2007), then denturists were legally to work with denture wearer directly in Denmark to provide subsidized treatments to low income people, old person living in nursing homes and mentally and physically handicapped people.

Dental laboratory technician is a true profession so in some countries they have the power to lobby the regulation and reorganize the dental service system in order to serve the new right: treat to denture wearer directly. There are 25 countries

and states certifying dental laboratory technician for providing denture to denture wearer directly to solve high denture demand (Malherbe, 2010a).

The last denture provider group emerged from that reason. They can provide denture to denture wearer directly in Canada, Australia, New Zealand, some states of USA, Switzerland, UK, Ireland, Denmark, Finland and The Netherlands (Malherbe, 2010b). Their registered professional nomenclature are varied such as licensed denture technician (Malherbe, 2010a). denturist, denturologist, dental prosthetist, specialized dental technician or clinical dental technician/technologist (Hansen, 2005). On the other hand, there are some organizations and countries disagree with the new position of dental laboratory technician such World Health Organization [WHO] in 2008, the American Dental Association [ADA] in 2009 and Germany (Flander, 1981)

Denture providers from the past to present were not only classified by job descriptions or legal right as above but also codified by dentist professionalism into two groups*: **dentist and ND denture provider**.* From this codification, the word "non-dentist denture provider" is invented to describe those actions of other former unregistered ND and registered denture provider. However, it is still controversial about the exact definition in the legitimated issue and dental service scope of dental occupation involvement (The society for clinical dental technology [Tsfcd], 2007: Online)

2.2 Non-dentist denture provider practices around the world

These still are controversies depending on the opinions in favor of or against ND denture provider. The descriptions of pro group agreeing with the solo work of denturist on denture service came from the organization about dental laboratory technician in some countries where they can legally work with denture wearer directly (International federation of denturists [IFD], 2010: Online). For example, the

definition from International Federation of Denturists in 1994 is “ Every Act having as its object the assessment and diagnosis of the oral cavity, the design, construction, repair, alteration, ordering and fitting of removable prosthesis” (Hansen, 2005) and the President of the National Denturist Federation USA stated : "Denturists are trained stand-alone practitioners who are in direct competition with dentistry for that market which is referred to as Removable Oral Prosthetics." (Tsfcd, 2007)

On the other hand, the definitions gave by the con group will mention that denturist cannot treat a denture wearer such as American dental Association defined a denturist as “a person who is educationally unqualified and not licensed to give the necessary protection of the public and to practice dentistry in any form on the public.” (ADA, 2009)

Meanwhile, there is an organization who illustrates the roles of denturist similar to dental technician under the supervision of dentist. In the international classification of health workers based on the International Standard Classification of Occupations (ISCO, 2008 revision) by WHO, denturist or dental technician were arranged in health associate professional occupation whom was encrypted as ISCO Code 3214, grouped in dental prosthetic technician, and described to design,; fit; service and repair dental devices and appliances following prescriptions or instructions established by a dental professional not directly to client (WHO, 2008: Online).

The practice of ND denture provider was not an interesting topic worldwide until the movement of dental laboratory technician in Tasmania, 1958, to approve their right in delivering denture to people. This is the starting point given only to dental laboratory technician occupation and not all former denture providers around the world were given a chance to expand their service boundary with legal right. There are legitimated ND denture providers practicing in 25 states and countries (Malherbe, 2010b). The scope of service given directly to denture wearer is in wide

range. In some country, denturist not only serve the fitting, relining, rebasing, duplication repairing service of removable prosthetic appliances including immediate dentures, full and partial dentures, over-dentures, and implant-retained dentures but also can delivery gum guards, mouth protectors and sleep apnea appliances, including metal substructures.

ND denture provider practice in Denmark: A Danish dental technician in 1843 could successfully authorized himself to provide denture service directly to denture wearer and it would not be illegal though non-dentist denture provider was legally in Denmark. Dentist could not lobby the legislation moreover a parliamentary commission, in 1913, announced that prosthetics should not be monopolize by dentists because the public should have alternatives. Dental laboratory technician cannot work alone but denturists are legitimated to serve all types of dentures to denture wearers directly. There are agreements between dentist, denturist with municipal governments to provide subsidizing treatments for low income people, old person living in nursing homes and mentally and physically handicapped people. A survey in 1999 showed that denturists were delivering 75-80% of all removable dentures in the country. (Malherbe, 2010b)

ND denture provider practice in Australia: Starting from Tasmania in 1958, non-dentist denture provider was prominent to every states of Australia. Dental Prosthetists in Australia will work alone at private prosthetic practice and referred to dentists and other health professionals when appropriate**.** They will be trained in Sydney, Melbourne and Brisbane to provide full and partial dentures and mouth guards. For implant retained over-dentures, they have to take some course. ADPA takes responsibility in representing the profession in the national level (Malherbe, 2010a).

ND denture provider practice in Switzerland: Dentist mainly worked in private clinic and provided other dental services not only full and partial prosthetics. In 1961

denturists were allowed to approach directly to public. This started from Zurich, Schwyz, Nidwalden and finally Appenzell-Innerrhoden. Their legal right includes providing all removable oral prostheses to denture wearer directly. To be denturist students, they must graduate the dental technology diploma (4 years of professional training) and work as a dental technician for at least 8 years. Only a five-year resident of Zurich who worked for three years in a laboratory at Zurich can participate the final exam to be a denturist (Malherbe, 2010b).

ND denture provider practice in Germany: The legally entry point of non-dentist denture provider in dental services began from 1914 in Germany. Because of deficiency of dental professional and to address unmet dental services demand, the German Imperial Diet legitimated dental laboratory technician to deliver complete denture to the public directly. This varied the dental workforce, nevertheless, this still could not serve the unfulfilled demands on partial denture and fixed prosthetic needs. The consequence of legislation not only elevated complete denture service but also hastened illegal removable and fixed prosthetic services directly to denture wearer by dental laboratory technician. In that moment, the quality of oral prosthesis services was down and German government was called out for ensuring oral service supplier qualifications although in March 1952, the Federal Republic of Germany reaffirmed the practice of dentistry, including prosthodontics, to fully trained and qualified dentists. At present time, no new denturists have been trained and since then, dentists had a monopoly on the public supply of dentures

ND denture provider practice in Canada: During the changing of legislation in Germany, denturists moved from Germany to Canada, non-dentist denture provider became prevalent due to the immigration of German dental technicians which is to fulfill the lack of trained dental technicians in Canada. Their job is still same in Germany, working directly to public, this is adopted by Canadian dental laboratory technician whom provided non-dentist denture and widespread around the country.

The increase of non-dentist denture provider which was illegal in Canada and it had led Canadian dental technician to legalize their non-dentist denture provider by setting up a denturist society across Canada aiming to qualify members and to reposition in dental society (Flanders, 1981). Nowadays, the mission was complete, non-dentist denture provider was legitimized by the Provincial Government all over the country: Alberta in 1961, British Columbia in 1962, Manitoba in 1970, Ontario in 1972, Nova Scotia in 1973, Quebec in 1973, New Brunswick in 1976, Saskatchewan in 1977, Newfoundland in 1984, Yukon Territoties in 1984 and Prince Edward Island in 2003; for the Northwest Territories and Nuvanut denturists only register to work (IFD, 2010: Online). The successful operation in Canada is a model for dental technician in many countries which is to deal with working to public legislation problem (Flanders, 1981).

ND denture provider practice in Finland: the Dental Act of Finland was passed in 1934, the legislation for dental technicians was enacted in 1964 and denturists were recognized in 1965. The requirements for applying a denturist curriculum are studying for 3-years dental technician and training for 5 years as a laboratory technician. Denturist can work alone in providing complete dentures, anti-snoring appliances, sport mouth guards and individual ear-protectors. The Denturist Union established in 1979 has been lobbying the government to permit denturists for providing all types of partial dentures (Malherbe, 2010b).

ND denture provider practice in the United States of America: America's denture crisis resulted from unmet denture demand of geriatric boomers who was born after World War II, many dentists are discontinuing to offer denture services because they have to do more restoration, dental schools have cut back their curriculum hours in denture training for dental students by 90% over the past thirty years and over the next ten years, one-third of all dentists who currently provide denture care are expected to retire from practice, leaving the US denture population

in a vacuum (Tsfcd, 2007: Online). Non-dentist denture provider by US dental technicians was elevated meanwhile there was a succeeded operation from Canada, US dental technicians were motivated to fight for moving from underground to legally denture services. The US Federal Trade Commission sent all state governments a letter of recommendation rule-making; encouraging them to institute the profession of non-dentist denture provider in their state, after conducting a five year study. In most legalized states denturists are not restricted in the services that they can provide (i.e. full and partial dentures) and are permitted to own denturist and dental practices. The states that legitimated denturist were in Maine in 1977, Arizona in 1978, Colorado in 1979, Oregon in 1980, Idaho in 1982 and Montana in 1984 (IFD, 2010: Online). Even some states legitimated denturist, American Dental Association has not accepted this role of US dental technicians which is given the definition of non-dentist denture provider as the unqualified and illegal practice of dentistry (ADA, 2009) and powerful American Dental Association lobbyist dramatically impacted on the Denturist movement.

ND denture provider practice in New Zealand: They are named Clinical Dental Technicians [CDTs] registered in 1988 to supply full and partial dentures directly to the public. CDTs will be trained nearby dental students and study with Prosthodontists and Clinical Dental Technicians at New Zealand's National School of Dentistry at the University of Otago. The curriculum covers 3-year academic course and 1-year clinical study. Job description covered all types of removable prosthesis and implant-retained overdentures for trained technician. They may provide mobile services for denture wearers in retirement complexes, homecare and rural areas. The registration board is the Dental Council. The professional association called New Zealand Institute of Dental Technologists [NZIDT] (Malherbe, 2010a).

ND denture provider practice in the United Kingdom: In 1984, The National Health Service was acquainted and induced big demand of dental treatment. The

insufficiency of dentist and a fee per item led low quality at high cost dental treatment. Denture wearer sought new provider; dental technician or denture prosthetist; to handle their denture problem for better quality at lower cost but this service was illegal. The Dental Council made legal action that only dentist could deliver denture straight to denture wearer. Dental technicians who directly service to denture wearer tried to move from underground to surface by calling themselves as clinical dental technician and set up The Clinical Dental Technicians Association to battle the argument in dental profession. The UK Government authorized the Nuffield Foundation and the Office of Fair Trading to investigate pros and cons of these issues in dentistry. Their reports summarized that the UK should have clinical dental technicians (Denturists) but there was a barrier of educational program. Because of confinement in the Dentist Act 1984, the Association contacted George Brown College in Toronto, Canada for establishing a course to qualify UK Denturists. There were more than 100 graduates from Great Britain and Ireland passed this program. The qualification was accredited by the Royal College of Surgeons of England. Clinical dental technicians will get a qualification by register with the General Dental Council in the UK. Finally, the first legislation finally was passed in the UK in 2007, clinical dental technicians can serve all removable dental appliances and take and process dental radiographs (Malherbe, 2010a).

*ND denture provider practice in Netherland*s: Non-dentist denture provider Act was passed by the Dutch Parliament in The Hague in 1989, Denturists can provide complete dentures and partial dentures under the supervision of a dentist. In 1998 there were expansion of practice so modern Dutch denturist can work as one of the Oral Health Team, and provide all removable appliances by their own judgement (Malherbe, 2010b).

ND denture provider practice in developing country: Illegal dental services in India can be found generally on the sidewalks nearby apothecaries, repairmen and

barbers. This illegal business is usually a family business. Such street dental quack services composed of teeth extraction and ready to wear dentures delivery. Even service fee is far less than licensed dentists though there is no qualify operator and guarantee denture wearer safety still poor Indians have to use this street service because they cannot afford dental service from dentist. The same situation is also predominant on the streets and in marketplaces in China (Malherbe, 2011), Pakistan (Abbasi, 2012), Trinidad (Naidu, Gobin and Newton, 2003), Guyana (Benzian, Jean and van Palestein Helderman, 2010) and Thailand (ASTV Manager online, 2012: Online). While in Sri Lanka (Silva and Gamage, 2011), Hong Kong (University of Hong Kong, 1996) and Thailand (Suphaluk Lertmanorut, 2005); there are ND denture provider served in fixed dental workplaces such as habitat, clinic or stall. On the other hand, in Taiwan, McKay Memorial Hospital in Taipei was equipped with the latest denture equipment available in the world and administrators requested the Denturist Society of Alberta to be consultant in establishing the new denture department and training of denturist (Malherbe, 2011)

2.3 Denture service in Thailand

Denture service was introduced formally to Thai society in early Rattanakosin era: A.D. 189:, with Dr. George Mcfarland qualified as dentist from USA in his private clinic at Pak-klong-tarad in Bangkok (Dental division, 2011: Online), prior to that informal denture service was operated by Chinese or Japanese dentist at their private dental clinic on Samyak and Jaroenkrung roads. After Thai dental council controlled all of dentistry with the Dental Act, denture services in Thailand were classified by legislation of denture provider into dentist (legal) and ND (illegal) denture services. This review literature focused only on removable denture service which involved ND denture providers. Denture service in Thailand has evolved from time to time on basis of oral health care capability development however; it still

does not meet denture demand of Thais and influenced with dental workforce, policy and public health insurance schemes.

2.4 Dental workforce

This section will picture situation of dentist and dental auxiliaries (dental assistants and dental laboratory technicians) whom some of them become ND denture provider, and another ND denture provider in terms of production, qualification, denture specialty and distribution.

2.4.1 Dentists

Production: In 2012, Thailand has 10 dental schools: eight public and two private. Eight public institutions are Chulalongkorn University, Chiang Mai University, Mahidol University, Khon Kaen University, Prince of Songkla University, Thammasat University, Naresuan University, and Srinakharinwirot University. Two private universities are Rangsit Universitiy and Western University where in 2011 dental school curriculum was in approving process by the Thai Dental Council in accordance with the guidelines for doctor of dental surgery program approvement and faculty of dentistry accreditation B.E. 2552 (The dental council, 2009a). Before the minimal requirement for dental school was set up however there are some characteristic among curriculum. For denture knowledge, a dental student has to take didactic courses of Prosthodontics for average 102 hours and laboratory/clinical in Prosthodontics for average 252 hours (Komabayashi, Srisilapanan and Korwanich, 2007). After graduating and have been registered, a dentist must have the capacity to provide uncomplicated removable partial and complete denture, crown and short span-fixed bridge (Phenkhae Lapying, 2008). The number of registered general dentists per year from 1997 to 2009 is approximately 400-450 dentists, while in 2011, there is an additional 700 dentists and in 2015, 1,000 dentists more (Suwit Wibulpolprasert, ed., 2004). Meanwhile, the demand of dentists in Thailand in 2017

was forecasted by Sirichai Shuprawat, et al that Thailand should have 17,999 dentists for effective service, support and administration (Ministry of public health and the dental council, 2009). In 2010, there are 10,515 practicing dentists in Thailand and there will be 16,315 in 2017 which is still not enough for practicing dentistry in Thailand.

Qualification: Thai dental students who graduated from a public dental school before 2011 would be given dental licensure from The Dental Council automatically. At present because of regulation of properties of individual whom want to grant the dental license B.E. 2551 (2008b), new graduates from both public and private universities have to pass two level of national dental licensure examination. The first is pre dental clinic or basic medical science in third-year. Issues for second examination in sixth-year are about dental clinic or clinical medical science, professional law and regulation (The Dental Council, 2008b). Thai dental council, moreover, is trying to introduce dentist society with continuing education courses which aims to maintain registration of registered dentists. Additionally licensing for international graduate dentists who want to practice dentistry in Thailand will be granted to be a dentist if their qualifications are in accordance with section 31 the Dental Act B.E. 2537 (1993) that include successfully passed the Examination conducted by the Dental Licensing Board (The Dental Council, 2008). Meanwhile, international graduated dentists can temporarily practice dentistry in Thailand as consultants or specialist in public sector or academic institutes for one year in accordance with the regulation B.E. 2550 (The Dental Council, 2007).

Denture Specialty: After granted by The Dental Council, a dentist who is interested in denture specialty can undertake postgraduate prosthodontics program in Thailand or abroad which have different curriculums and time spend depend on the postgraduate degree. The postgraduate certificate, residency training, master's or PhD degree programs may take one to three years and different in detail of

curriculums however trends of research and clinical components in curriculum are about biomaterials, dental implantology, maxillofacial prosthetics, oral rehabilitation and occlusion. Post graduated prosthodontists can provide dentures for those with special problem that are difficult for general dentists to deal with such as denture bearing area problem, occlusion problem, and some can manufacture oral or maxillofacial prostheses for denture wearer with congenital and acquired defects of the head and neck. The production of prosthodontists for all degrees in Thailand from 2005 to 2010 is average 22 persons per year (Bureau of dental health, 2006; 2007; 2008; 2009; 2010; and 2011).

Distribution: When newly graduates from public dental schools are granted to be dentists, they have to work in a unit of public sector for three years depending on their preferences. The incentive payments for dentists in public sector are fixed monthly salaries however in particularly remote area, government will pay extra for them. Some new registered dentists who want to be in private sector have to return some fees to Thai government.

Data from Dental Health Division in Department of Health and Bureau of Policy and Strategy illustrated that in 2010 there were 10,515 dental practioners: 4,882 in public sector, 45 in state enterprise and 5,588 in private sector (Bureau of dental health, 2011). Around 50 percent of dentists worked in private sector and had tendency to increase slowly (Komase Witchawuth, 2008). In public sector, the number of dental practitioners by agency was 3,503 in Ministry of Health, 927 in Universities, 220 in Ministry of Defence, 144 in special administrative agency, Bangkok, 71 in Ministry of Inferior and 17 in other ministries (Bureau of dental health, 2011). From 2006 to 2010, the proportion of dentists by agency was the same in each year: 70 in Ministry of Health, 20 in universities and 10 in other public agencies. The proportion of dentists by type of hospitals in the Ministry of Health for community hospitals is doubled which is higher than in regional /general hospitals and has the

tendency to rise due to the increase of incentive payment for remote area (Bureau of dental health, 2006; 2007; 2008; 2009; 2010; and 2011).

Total population of registered dentist ratio is 20,061:6,075 (Bureau of dental health, 2011) which was higher than the forecasted ratio of 1:7,114 in 2017 (Suwit wibulpolprasert, 2004) and the expected ratio in 2017 is 1: 3,959 for service, support and administration (Ministry of public health and The dental council, 2009). Even the total ratio looked better for the next years to come though dentists still were not distribute equally throughout the regions of Thailand. In 2010, most dentists worked in Bangkok Metropolitan so the ratio 1:1,097 is higher when compared to 1:10,942 in regional areas. The ratios in central part, northern part and southern part are not much different: 1:8,574, 1:9,631 and 1:9,687 while the ratio in northeastern part is lowest 1:16,368 (Bureau of dental health, 2011). This pattern of ratio was evident every year and the ratio in Bangkok was always around 15 times higher than in northeastern part (Suwit wibulpolprasert, 2004). In 2010, all degrees of prosthodontists were from public sector for a total of 296 dentists and from private sector for a total of 209 dentists. The highest distribution of prosthodontists was in Bangkok Metropolitan when compared to central part which was highest than the other three parts (Bureau of dental health, 2011).

2.4.2 Dental auxiliaries: dental assistant, dental laboratory technician

Dental auxiliaries in denture service system are dental assistants and dental laboratory technicians who assist beside dental chair and manufacture denture in laboratory, respectively. Other dental auxiliary, dental nurses, mainly work in oral health promotion and primary dental care area and not involved in denture service system as much as both mentioned dental auxiliaries except dental nurse who occasionally assist dentist in denture providing visits.

2.4.2.1 Dental assistant: Thailand Standard Classification of Occupations [TSCO] for dental assistant is 3225.20 which described that they have to assist dentist for dental service both chair-side and laboratory duties (Ministry of Labor, 2001). There are various ways to be a dental assistant: training on the job, taking short courses 4- to 6-month in trade schools or studying dental assistant programs 1-year in community and junior colleges, vocational schools, technical institutes, or the Armed Forces. To apply for on the job-training and short courses in trade schools do not require a high school diploma or its equivalent which is contrary with the dental assistant schools application. One year diploma program in both public and private sector have to accredit the program conforming the regulation of conditions in certifying dental assistants B.E.2551 (The Dental Council, 2008a). The curriculum will cover all of dental service including prosthetics, for example Mahidol curriculum which opened from 1968 until now will take didactic courses of Prosthodontics for 1 credit and dental materials 2 credits and laboratory/clinical study in all dental services for 9 credits (Mahidol university, 2007a: Online). There is no research about the production of dental assistants however data from Dental Health Division in Department of Health showed that the increase of dental assistants from 2005 to 2010 are average 21 persons per year (Bureau of dental health, 2006; 2007; 2008; 2009; 2010; and 2011) which is not the real production rate, only the capacity of the dental assistant school of Mahidol University is 80 dental assistants per year which is more than the average increasing rate in that data (Mahidol university, 2007b: Online).

Data from Bureau of dental health in 2011 showed that since in 2010, there were 2,034 dental assistants: 1,921 worked in public sector, 12 in state enterprise and 101 in private sector which is not enough, for one operator even dentist or dental nurse should practice dentistry with one assistant, especially a dentist do denture service which have many procedure and equipments. The dentist

to dental assistant ratio in Bangkok Metropolitan is 1to 0.78 which higher than 1to 0.47 in universities and 1 to 0.38 in Ministry of Health. Considering only the ratio in Ministry of Health, It can be found that the ratio 1 to 0.54 in regional/general hospitals is higher than 1 to 0.30 in community hospitals which are very long distance to reach 1 to 1 dentist-dental assistant ratio in 2017 for every direct dental service sector. To fulfill the present deficiency, dental assistants in private sector and some community hospitals comes from on the job-training and do not have the diploma. The specialty of dental assistant depends on the years of experiences on the job-training. Moreover, from 2002 until now, dental assistant can take course in some Sirindhorn college of public health to qualify as dental nurse.

2.4.2.2 Dental laboratory technician: TSCO for dental laboratory technician is 7311.25 which described that they have to work with the prescription of dentist for prosthesis and orthodontic appliance (Ministry of Labor, 2001). Unfortunately, there is no regulation or dental organization involved the qualification dental laboratory technician curriculum so the curriculums vary from on one to two year program. A high school diploma or its equivalent is required when applying on both type of curriculum. One-year diploma program is the cooperation between the private university and cross-country dental laboratory while 2-years diploma or high vocational certificate program is teaching in Mahidol University opened in 1972, Prince of Songkla University started in October 2011 and vocational schools in 2005. For 2-years program, students will take courses of Prosthodontics and orthodontics at least 25 credit and dental laboratory not less than 20 credits (Office of vocation education commission, 2003).

After graduation, dental technicians can fabricate all type of removable denture, some type of fixed oral prostheses but they have to train for implant and maxillofacial prostheses. Dental technician has more chance than dental assistance for continuing education because in 1998 Mahidol university launched

bachelor of Technology Program in Dental Technology (2-Year Extension) for dental technician who have two year-experience in dental technician career and want to have a bachelor degree.

There is no research for the production of dental technician however data from Dental Health Division in Department of Health showed that the increment of dental technicians from 2005 to 2010 is 4 persons for 6 years (Bureau of dental health, 2006; 2007; 2008; 2009; 2010; and 2011) which is underestimate for the real production. The production rate of dental laboratory school of Mahidol University is 15 persons per year so Thailand should have at least 393dental technicians (Mahidol university, 2007b: Online). Data from Office of Vocational Education Commission showed that in 2011 there were 19 students studying in this program and in 2012 there are 16 students just apply for this program (Student-statistical data service, 2013) and Prince of Songkhla University just accept 15 student in 2011. Moreover, data from Dental Health Division in Department of Health, there are only 98 dental technicians where 81 technicians were distributed in public sector and 17 technicians in private sector. There are 42 dental technicians worked in Ministry of Public Health, 38 technicians in universities and 1 technician in Ministry of Defence. For Ministry of Health, 37 dental technicians served in regional/general hospitals, 2 in community hospitals and 3 in other unit (Bureau of dental health, 2011) As the result of shortage of dental laboratory technician, few large dental laboratory such as Hexa Ceram trains personnel internally with 4-months course which can produce 8-10 new dental technicians per year to work in Hexa Ceram.

2.5 ND denture provider in Thailand

Production: ND denture provider from the past to present can be classified into four types of origin.

First group are Thais who had hand skill in delicate job such as a noblewoman in The Rhyme Mom Pedsawan (ASTV Manager online, 2006: Online). In Rattanakosin era, reign of King Rama III, black colored teeth from chewing betel nut were fashionable in the early period. The noblewoman in the rhyme, she shaped a piece of coconut shell into a small tooth formed chip by herself or using wooden artificial teeth imported from China, made by Jeen Yoo “tooth artist”, tied with adjacent teeth to close her gaps in the mouth.

Second group are foreigners whom trained to practice dentistry from their countries such as China or Japan then moved to practice dentistry including denture and opened dental clinic in Thailand (Bureau of dental health, 2000: Online). However, because of the Medicine Practice Act A.D.1936, this group was positioned as second-class dentist and finally faded out due to the monopolization effect from the Dental Profession Act A.D.1994.

Thirdly, Thai health personnel whose job involved denture procedure such as dental laboratory technician (ASTV Manager online, 2006: Online), military doctor (Suphaluk lermanorut, 2005) or dental assistant etc trained on the job about denture procedure. Because of high profit and thinking it was not a complicated task, they operate denture services solely. There is no evidence about this type for operation at present time.

The fourth group will gain denture knowledge from senior ND denture provider by apprenticeship. Seniors will teach in real situation inside dental stall; for descendent both siblings and students. Apprentice will learn in a relaxing atmosphere and pay cheaper tuition fee than general school. Nowadays, this type still operates in some provinces (Suphaluk lermanorut, 2005) such as Bangkok, Khon

Kaen, Chiang Mai etc moreover some teacher were supplying materials to their apprentice after they graduated.

Qualification: In the past, there were Chinese dental offices on Samyak and Jaroenkrung road showing some pieces of removable denture, line of extracted teeth and golden copings on the window to advertise their business. Moreover, in market or on street side, tooth removal was demonstrated occasionally to invite audience to get rid of a decayed tooth (Bureau of dental health, 2000: Online). According to the Medicine Practice Act A.D.1936, dentistry was grouped into two classes: *first class dentistry*, individual had to graduate bachelor of dentistry or certificate from the academic institution in Thailand or aboard. Meanwhile, for *second class dentistry* they can be trained from hospital or public academic institution however both classes had to be qualified by board of control for health professionals. This Act framed dental service in Thailand including denture service legally available only from dentist and dental hygienist not from other former dental service provider such as Chinese, Japanese or Thai from dental dynasties. Moreover, there was no mention about the scope of dental service including denture service between dentist and dental nurse in the Dental Act.

Dental Professional Act B.E. 2537 is the expansion for defining the dental practice and stipulating who permitted to practice dentistry whilst Medical Facilities Act B.E. 2541 limits the dental service in dental clinic only. These two Act allowed only dentist who are certified by the Dental Council of Thailand to deliver denture straight to denture wearer in dental clinic hence another former denture service provider including some dental hygienist, some dental laboratory technician, Chinese or Thai from dental dynasties and self-learning dental technician are illegal to provide denture directly to client. After the enactment of these two Acts, illegal dentistry has been controlled more strictly. The penalties of Dental professional Act B.E. 2537 are imprisonment of not more than 3 years or a fine of not more than

30,000 THB or it could be both. The penalty of Medical Facilities Act B.E. 2541 is imprisonment of not more than 3 years or a fine of not more than 60,000 THB and it could be both as well.

Report of services: Data collected from news, websites and informal resources from 2001 to 2012 illustrated that type of ND denture services can be grouped by mode of delivery. Non-mobile service was reported in Chiangmai and Khonkaen (ASTV Manager online, 2006: Online), Ratchaburi (Chow Muang Rat, 2004: Online), Bangkok (Svazti, 2007), Nakonsawan (Thamdee, 2010: Online), Nontaburi (ASTV Manager online, 2011: Online) and Pattani (Maikaen hospital, 2012) meanwhile *mobile unit type* was addressed in Tak, Bangkok (Svasti, 2007), Loei (Mor fun Thai dan, 2007: Online), Nakon Phanom (Story from pharmacist, 2010: Online), Buriram (ASTV Manager online, 2012: Online) and Trad (ASTV Manager online, 2006: Online). Moreover, there were reports in Ranong (Thaisouth team, 2004: Online), Nongkhai (Nongkhai oral helath department, 2008: Online) and Udonthani in 2011 about hazard of ND denture services but mode of delivery was not mention.

The qualitative research of Suphaluk Lertmanorut in 2005, investigated deeply the role of street denturists and the factors of their existence of street denturists at Tha-Pra-Chan, Bangkok, in viewpoints of clients and ND denture providers. In 2005, there were more than 15 fixed dental and one or two mobile unit in Tha-Pra-Chan. However ND denture providers in these clues were very underestimated than the real situation, both many cases with problematic or with successful ND denture were not reported because dentists had no time or did not know a channel to report cases.

2.6 Involved government policy

The attempt of Thai government to solve the ND denture problem has been shown by executing the Dental Act and Medical Act (as described in qualification of ND), by reducing barriers which included removable denture service in all types of public health insurance (which will be showed later in next part) and by launching Royal Denture for the Elderly in Commemoration of HM the King's 80th Birthday Anniversary project.

Royal Denture for the Elderly in Commemoration of HM the King's 80th Birthday Anniversary project started from 2005 until present to solve the denture need problem in elderly 60-years up. Objectives of the project are to develop the dental service system that provide full or partial dentures to enable proper mastication of food among the 30,000 target, underserved elderly per year, or approximately 1.5% of the total elderly population in each province and to develop the dental service system that prevent oral diseases. Tactics of seeking target group in this project depend on the context of dental clinic and hospital. Some picked up target group; elderly 60-years old and up with edentulism; from their denture waiting list and some coordinated with primary care unit to seek disadvantaged elderly with conditioned of project. There were more than 196,619 pairs of complete denture delivering from 2005 up to at present, nevertheless this project still had long waiting list problem from insufficient dentists (Eleventh regional health promotion center, 2011) even this project can solve the denture need problem in target group though the denture need in another group was not solve yet.

2.7 Health care utilization model

There are many determinants that influent the decision to utilize health care such as age, gender roles, culture, economics, knowledge, belief in efficacy, access,

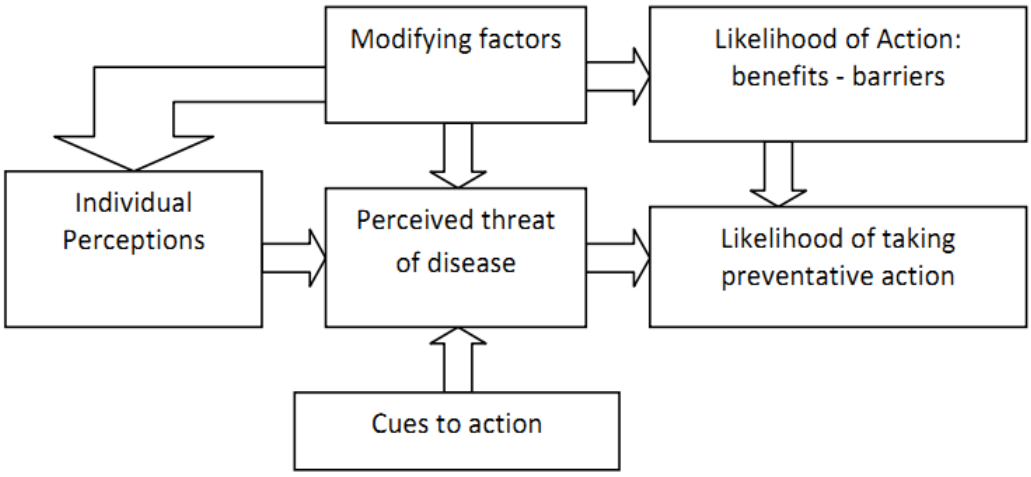
perceptions, and social roles. To understand the complexities of health care utilization, there are three models of health care utilization: Rosenstock's health belief model, Andersen's health behavior model, and Young's choice-making model.

2.7.1 Health belief model

The Health Belief Model (HBM) is a psychological health behavior change model. This model was developed by Rosenstock et al in 1994. The factors considered by an individual when treating and preventing disease depend on four central variables which are shown in the figure 1.

1. Individual perceptions on susceptibility to disease
2. Individual perceptions on illness severity
3. Individual perception on benefits versus costs
4. Individual cues to action based on influence from family, media, friends, or well-known citizens

Figure 1 Rosenstock's Health Belief Model (adapted from Wolinsky, 1988)



The health belief model suggests that beliefs of individual about health problems, perceived action's benefits and barriers, and self-efficacy describe engagement or lack of engagement in health-promoting behavior. It is essential to

stimulate with cue to action to trigger the health-promoting behavior and service usage (Janz et al, 1984).

2.7.2 Andersen's health care utilization model

This model explained the health care utilization by a number of determinants as follow in figure 2

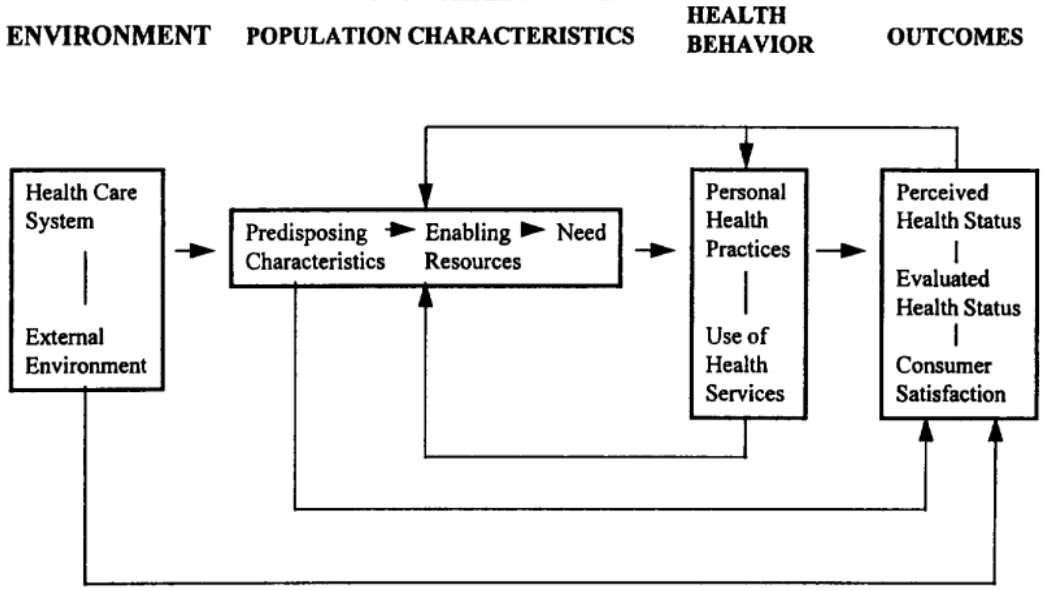
1. Predisposing factors that existed prior to illness onset

2. Enabling factors that were the accessibility and availability of resources

3. Need that included both percieved and professional evaluation

This model has been developed continuously up to phase 4 in 1988 as shown in figure 2 and it is used widely to explain dental treatment. In the study of Baker in 2009, he applied this model to oral health.

Figure 2 Andersen's health care utilization model Phase 4 (Andersen, 1995)



2.7.3 Choice-making model

This model was developed by Young in 1981. It was used to explain the health care utilization in ethnographic studies in Mexico as shown in figure 3. There were 4 components as follow

1. Gravity of illness relied on the assumption that the culture codifies illnesses by the level of severity

2. Knowledge of home treatment relied on lay referral to treat themselves prior to utilizing a professional health care system

3. Faith in treatment relied on the individual's belief of efficacy of treatment

4. Access to treatment relied on the individual's evaluation of health service's cost and the availability of services

.

Figure 3 Choice-making model (Young, 1981)

Meanwhile this model did not consider about other enabling resources and outcome which is important for analyzing pathway of health care utilization.

2.8 Factors related to ND denture service utilization

Population characteristics consist of three categories: predisposing factors, enabling resources and denture need.

2.8.1 Predisposing factors

2.8.1.1 Age

Advanced age is the first predisposing factor because generally elderly has more loss of tooth for any reasons than young ones. Thailand oral health survey 6th in 2007 revealed that the percentage of person loosing teeth were increasing by age:

5.42 in 12 yrs old, 12.09 in 15 yrs old then dramatically shooting up to 82.84 in 35-44 yrs old, 94.04 in 60-74 yrs old and 98.97 in 80 yrs old. On the other hand, comparing the results of oral health survey starting from 2nd to 6th, trend of losing teeth in 35-44 years old and 60-74 years old is better but the pocket depth of periodontitis disease 6 mm up in those groups tended to raise that means losing teeth still would be the problem in the future (Bureau of dental health, 2008). The result is as the same as mentioned in the study of Shah N. et al in India (2004) that tooth loss increased with advancing age in 1,240 elderly 60 year-old up Indian samples. Additionally, Ratanawilaisak T.and Nanudorn J. studied in Burirum: Thailand described that having more than 20 natural teeth was related with the increment of age: 64.5% of 60-69 year-old, 31.9% of 70-79 year-old and 3.9% of 80-92 year-old ($p<0.001$) (Thida and Jiraporn, 2011).

Older denture wearers tended to use dental quacks more than younger in the study of Naidu R.S. et al in Trinidad (2003) which investigated in 212 Trinidadian. The result showed that mean age of denture wearers used dental quacks was 39.1 years old and had significant difference from unused group (33.9 years old) with $p<0.01$ because they were familiar and felt that ND had good skill. However, considering with Thai traditional medicine which is another choice of physical treatment, age was not the predictive factor to forecast the acceptance of service (Chachawarn Naruphonjirakul, 2005-2006).

2.8.1.2 Sex

Regarding sex as the factor, the study of Shah N. (2004) in 1,240 Indian elderly 60 year-old up showed that males were wearing dentures significantly more than females (17.6%, 12% respectively with $P < 0.01$). The result is also similar when Baran I. et al in 2007 studied 510 elderly denture wearers aged 50 years up in Turkey, there is a significant difference in the proportion of complete denture between males and females in which males has the proportion of complete denture about 10% more

than the proportion of females (P=0.0232). On the other hand, Ratanawilaisak T.and Nanudorn J. studied in Burirum (2011): Thailand; 404 participants aged from 60 to 92 years old found that 73.5% of female with natural teeth more than 20 teeth was higher than 26.3% of male with statistical significant at p-value=0.004. It is a controversy about how male or female cared their teeth or ate snacks more often.

For denture satisfaction, Pan Sh.et al reported in 2008 that data from 256 samples in Canada, after wearing denture for 6 months, elderly males are more satisfied with conventional complete denture than female in terms of aesthetics and chewing function with p-value<0.05 and after 12 months, there was only aesthetics still rating different between males and females by t-test.at p-value < 0.05.

There was no significantly different in the gender of whom utilizing dental quacks in Trinidad in the study of Naidu R.S. et al in 2003. On the other hand, Thai traditional medicine, sex is predictive factor to forecast the acceptance.

2.8.1.3 Education level attainment

The study of Naidu RS et al in 2003 showed that Trinidadian using dental quacks were 43% attended secondary school, 25% primary school, 18% technical college, 9% university and 4% none. These respondents were significant difference comparing to other whom did not attend a dental quack. Most denture wearers use extraction teeth services more than denture services. Considering massage therapy as the alternative treatment for treating physical problem, it was used by higher formal educational level user more than lower because of gathering information about choice of treatment process (Willison, 2009). Hence, this is different from ND denture service user because massage therapy is not a quack.

2.8.1.4 Work status

Naidu RS et al reported in 2003 about the utilization of dental quacks in Trinidadian that denture wearer in unpaid or unskilled employment had patronized dental quacks more often than another groups with p<0.05: 34% lower non-

manual/middle professional, 28% skilled manual, 17% unskilled manual, 9% housewife, 7% retired / pensioner, 5% professional/manager, and 1% unemployed. On the other hand, Occupation had no relationship with the acceptance of Thai traditional medicine. (Chachawarn Naruphonjirakul, 2005-2006). As educational level, higher SES user utilized massage therapy more often than lower SES user because of gathering information about choice of treatment process (Willison, 2009)

2.8.1.5 Income

Denture wearer with low income level always came to use dental quack service. This is also observed in Trinidad (Naidu, Gobin and Newton, 2003), Hong Kong (University of Hong Kong, 1996) and India (Sandesh and Mohapatra, 2009). In Thailand, This is also the same reason why denture wearer coming to see ND denture provider at Tha-Pra-Chan, Bangkok. On the other hand, denture wearer with high SES always sought cheaper treatment for themselves by surfing on internet.

2.8.2 Enabling resources

2.8.2.1 Area of residency

The reason of coming to see ND is insufficiency of dental service in rural area Naidu, Gobin and Newton, 2003). Data from the study in Trinidad (Naidu, Gobin and Newton, 2003) showed that there are less number of the public dental clinic compared to population's ratio, there are more proportion of clients who visited dental quacks in the region ($p< 0.05$). The same phenomenon was found in India (Sandesh and Mohapatra, 2009), Guyana (Benzian, Jean and van Palenstein Helderman, 2010), and Sri Lanka (Silva and Gamage, 2011) .

2.8.2.2 Denture fee

Price of ND denture services was cheaper than dentist services, some started with 200 THB for tooth replacement and could be bargained for multiple artificial teeth replacement (Suphaluk Lertmanorut, 2005). This reflected that the difference between denture service of dentist and ND that client felt free to talk with ND about

denture fee. This was observed also in India (Sandesh and Mohapatra, 2009) and Taiwan (Moore and Shiau, 1999). So since all of ND denture provider was not qualified and did not pay tax to government, these may be the cause of lower price than dentist (Benzian, Jean and van Palenstein Helderman, 2010)

2.8.2.3 Waiting list

Interval in waiting time (period) before first visit to making denture is always more than one week because there is not only denture service but dentist in public sector has to serve another dental treatment needs in restoratives, oral surgery, and periodontics. The waiting time for dentist is always is longer than ND denture provider.

2.8.2.4 Public health Insurance

In the past, public health insurance did not include denture service but after health care system reform in 2001 public health insurance changed into three categories: the universal coverage of health care scheme; Civil Servant Medical Benefit Scheme-CSMBS; and Social Security Scheme-SSS. The coverage of population is 75.33% by 30 baht scheme, 15.72% by SSS, 7.78% by CSMBS, 0.92% by other insurance, and 0.24 % had no insurance (Ministry of Social Development and Human Security, 2011). The usage time of a removable denture is 5 years for all public insurance before getting a new one. There are differences among three public health insurance schemes such as in the mode of payment and reclaim process but has the same quality for denture service.

Universal coverage scheme is the capitation-contracting model for claiming after denture service which including in 2003, National Health Security Office-NHSO set up the ceiling rates for claiming denture in 2011: 2,400 baht for single complete denture coding 9202; 4,400 baht for a pair of complete denture coding 9203; 1,300 baht for partial denture with 1 to 5 artificial teeth coding 9204 and 1,500 baht for partial denture with more than 5 artificial teeth coding 9205. If denture fee is not

much more than the ceiling rate, the hospital will claim the fee of denture as high cost care from NHSO so denture wearers do not have to pay anymore (National Health Security Office, 2012).

CSMBS is the public health insurance for civil servants. In case of acrylic removable denture service started from 2 August 2010, denture wearers have to pay first then reclaim from the government using the same coding and ceiling rate of NHSO (Comptroller General's Department, 2010). And there is no data about the reclaiming procedure if it will be barrier or not.

SSS will collect revenues from mandatory monthly income from the employers, employees and co-payment by government. For denture service, begins on 31 August 2011, only acrylic removable denture could reclaim from fund, denture wearer has to pay then reclaim money back. The reclaim rate is the same as the ceiling rate of 30-baht scheme (Social Security Office, 2012) and CSMBS. And there is no data about the reclaiming procedure if it will be barrier or not.

2.8.2.5 Information source

Information source is very important for ND denture providers because they cannot advertise themselves obviously. From the study in Trinidad, ND users from small communities and villages will use service, because NDs are relatives or neighbor so they feel more comfortable with "one of their own" (Naidu, Gobin and Newton, 2003). The same situation was observed in Hong Kong (University of Hong Kong, 1996), Guyana (Benzian, Jean and van Palenstein Helderman, 2010), and Thailand also (Mor fun Thai dan , 2007: Online). Not only information from relatives or neighbor, some ND showed denture making procedure in market to advertise himself directly.

2.8.2.6 Information content

ND strategies to motivate user are various. For example, lessen denture fee, pay by installments, make in short time, can negotiate denture appearance, or bargain denture cost if he recommends to other (Suphaluk Lertmanorut, 2005). After the person gets the information from ND, he/she always discusses it with other person about ND services. "Word of mouth" is a kind of effective marketing techniques in which individuals confirmed information so it is reliable and easily to satisfy especially if it has more on positive feedbacks (Matos and Rossi, 2008). Feedbacks from opinion and direct experience of person varied but targeted same goal which is to motivate listeners to make denture with ND because of good personal skill, cheap denture fee, pay by installments, easy to approach, negotiable, or short making time (Mor fun Thai Dan, 2007: Online).

2.8.3 Denture Need

2.8.3.1 Professional need

Edentulism: Data from Thailand National Oral Health Survey 6th in 2006-2007 showed that percentage of adult 60-74 years old with edentulism decreased dramatically from 20.6 in 1989 to 8.6 in 2001 but increased to 10.47 in 2007. The same trends found in every regions of Thailand. Percentage of elderly 60-74 years old with edentulism in urban area was higher than in rural area. Percentages of complete denture need by region were lowest in northern part then higher in southern and northeastern part and highest in the central part of Thailand.

Trend of tooth loss: Data from Thailand National Oral Health Survey 6th in 2006-2007 showed that percentage of adult 35-44 years old with at least 20 functional teeth increased from 92.7 in 1984 to 96.2 in 2007. Percentage of elderly 60-74 years old with edentulism decreased from 16.2 in 1984 to 10.47 in 2007, the same as percentage of dental caries prevalence in deciduous teeth in 3 years old

decreased from 66.5 in 1989 to 61.37 in 2007 and 5-6 years old decreased from 25.6 in 1984 to 19.36 in 2007. On the other hand, percentage of prevalence of dental caries in permanent teeth in 12 years old increased from 45.8 in 1984 to 56.87 in 2007and the pocket depth of periodontitis disease 6 mm up in adult and elderly tended to raise. Even the loss of all teeth decreased but the loss of some teeth was increasing.

2.8.3.2 Percieved need

There are very few Thai researchers studied the denture need perceived by Thai denture wearers. However, percieved need always lower than professional need because percieved need derived from many causes such as appearance, chewing, speaking, need of relatives, or accessible denture service. Kantaporn et al. in 2007 researched the comparison of denture need by professional, by oral health-related quality of life (OHRQoL) and by perceived need of Thai elderly in Pathum Thani Province. The result showed that 51.5 percentages of denture wearers with professional had normative need for denture nevertheless the sample need and OHRQoL for denture need could not forecast or supplement the professional need but could consider as cofactor for setting dental assessment and service. The result is the same as the study of Patcharpwan Srisilapanan et al in 2003. Percieved need was less than professional need 40%.

2.8.3.3 Denture volume

Denture volume in denture market was calculated from denture need and number of Thais in that age group during that period. In 2007, professional need of complete denture for elderly 60-74 years old was 10.47 percentages (Bureau of dental health division, 2008) and estimated Thai elderly 60-74 years old in 2007 was 5,072,800 (Pramote Prasartkul, 2007) so the calculated complete denture volume was around 531,000 pairs of complete denture. The expenditure for this volume estimated by the National Health Security Office-NHSO rate for claiming denture

4,400 baht (National health security office, 2012), the amount was 2,336,400,000 baht. This amount was estimated only from one minor group of losing teeth denture wearers moreover, there were another large age groups which had denture needs for complete denture and partial denture. Nowadays, denture market is sharing with dentist and ND denture provider. Among dentist profession, the competition has occurred between general practiced dentists and prosthodontists whilst ND denture providers have tackled with various strategies which will be discussed in further section.

2.8.4 Denture service characteristics

2.8.4.1 Type of denture provider

As in report of ND service in part III denture service system in Thailand

2.8.4.2 Procedure interval

For one tooth replacement with removable denture service, user has to come to see dentist at least 3 times: oral examination and impression taking, denture delivery and follow up. For complete denture, visiting dental clinic 5 times is minimal from oral examination to follow up step.

From the study of Wungchun et al in 2005, over three-fifths of patient suffer from long queue for some kind of treatment.

Some ND claimed that they could make complete denture in 1 day (Suphaluk Lertmanorut, 2005; Svasti, 2007). This affects directly to earn time of denture wearer so this is very effective strategy.

On the other hand, there are simplified acrylic removable denture techniques which can deliver denture to patient within one or three visit (Bureau of dental health, 2005). These techniques have been developed to fulfill the need of rapid process of patient. Nevertheless dental laboratory technician is the key person who simplified technique which is not sufficient for every province.

2.8.5 Outcomes of denture service

2.8.5.1 Satisfaction on denture

Satisfaction of denture wearers from their dentures is not based on the quality of denture. It depended on the adaptation of denture wearer which will express on the denture wearer satisfaction on denture even that denture has problem in the professional view (Akeel 2009).

"ND denture services generally had clinical complications", this might be the assumption of health care professional; especially dentist; because they contacted only ND denture with complications. Denture wearer with problematic ND denture would come with sign and symptom of pain (Mor fun Thai dan, 2007; Story from pharmacist, 2010; Udontani, 2011: Online) , cannot chewing (Mor fun Thai dan, 2007: Online), swelling (Story from Pharmacist, 2010; Nongkhai oral health department, 2008) and bad odour (Thaisouth team, 2004: Online) which ended with removal of denture (Mor fun Thai dan, 2007; ASTV Manager online, 2009; Udontani, 2011: Online). Furthermore we don't know about denture wearer obtained acceptable quality denture from ND with no complaints.

2.8.5.2 Evaluated denture characteristics

Causes of clinical problems were non hygienic procedure (Suphaluk Lertmanorut, 2005), improper preparation of mouth (Udontani, 2011: Online) and improper design of denture (Thaisouth team, 2004; Nongkhai oral health department, 2008: Online). There are many complaints about ND denture such inflammation, swelling, pain on chewing, and bad odor. Dentist can evaluate denture by examining pieces of denture and adjacent soft and hard tissues for lesion or abnormality from denture.

Non-professional techniques used in ND denture services to retain denture are suction disc on palatal surface of upper complete denture, applying self-cured

acrylic resin on proximal surface of artificial teeth and natural teeth or remaining root, and tied wire from denture to adjacent teeth (Hans, Hans and Nagpal, 2014).

2.8.5.3 Satisfaction on denture service

Andersen scoped the consumer satisfaction with 5 aspects: convenience, availability, financing, provider characteristic and quality of services (Andersen, 1995).

For dental service by dentist, Wungchun et al studied in 2005 and found that patients satisfied dental service in every aspects. However, waiting time for obtaining services was negatively related to satisfaction with r=-0.285.

For ND denture services, denture wearer felt freely to talk with ND denture provider and had the rights to complain, negotiate for designing and selecting type of denture in natural appearance, and bargaining for denture fee. ND denture service users were satisfied on a shorter time consumed to produce a denture and on length of waiting list. (Suphaluk Lertmanorut, 2005),

Non-hygienic procedure was not the problem, client accepted this fact given that the price is lower, and they just have to bare with it. (Suphaluk Lertmanorut, 2005).

"Actually I wanted to see a dentist but he couldn't satisfy me. For hygiene, if it's not safe enough, people could be died. I was sure it's safe enough."

"It's impossible that these stalls would be as clean as the clinic. When they put a denture into my mouth, I couldn't help thinking that I could contact a disease but I haven't seen anyone sick because of the denturists."

Mobile service of ND denture provider saved money and time even it had no warranty but it was very convenient (Svasti, 2007).

"Whenever I came to see a denturist, I had to take amoxil because I had a sore throat like being infectious."

CHAPTER III

METHODOLOGY

3.1 Population

3.1.1 Population

Denture wearers with removable denture in Thailand

3.1.2 Study population

Samples were recruited from voluntary provinces in each region of Thailand.

Inclusion criteria: Denture wearers wearing removable denture which was delivered not more than two years ago.

Exclusion criteria: denture wearers whom refused to sign inform consent

Cases: denture wearers obtained removable denture from ND

Controls: denture wearers obtained removable denture from dentist

Reason for matching on age, sex, and educational level attainment:

Age: To reduce confounding effect from age, tooth loss, and denture service utilization

Sex: To reduce confounding effect from sex, tooth loss, and denture satisfaction

Educational level attainment: To reduce confounding effect from educational level attainment and denture service utilization

3.1.3 Sample size

172 cases and 688 controls calculated with Schlesselman equation in 1982 (Tassamee Nuchprayoon and Termsri Chamnanjarakij, 1998)

$$m = \frac{\left[Z_{\alpha/2} + Z_{\beta} \sqrt{p(1-p)} \right]^2}{(p - \frac{1}{2})^2}$$

Z_{α} is 1.96 when α is 0.05

Z_{β} is 1.28 when β is 0.1

m is sample size per group

p is 0.6923 derived from $\Psi/(1+\Psi)$; when Ψ is Odds ratio (OR)

OR is 2.25 from pilot study in Maikaen hospital

Table 1 Number of denture wearers at Maikaen hospital in the period of one month

Age	Obtained denture from non-dentist	Obtained denture from dentist	Total
Less than 35 years old	4	8	12
35 years old and above	2	9	11
Total	6	17	23

Finally, m is 43 per group. Ratio of case to control is 1:4. Totally case: control sample size is 172 : 688.

3.1.4 Sampling method: conditioning sampling

1. Recruit voluntary district areas by calling head of dental office of district Hospitals for cooperation
2. Case: Starting point is identifying problematic area with dental officers then asking health volunteers to find out the first denture wearer who obtained denture from ND. From first case, he/she will be asked for

information of second case and this step will be repeated again until last 10^{th} user

3. Control: Check from denture wearers in list of dental office in hospital to match with chronological age, sex and educational level attainment.
4. Recruitment plans: Calling to inform chief of dental clinic about the study, data collecting fee for oral examination and being interviewed, and delivering denture cleanser to sample

3.2 Data require

Paper questionnaires (Appendix 1) in Thai were completed by a trained interviewer for every sample (case and controls), after signing inform consent and blind for interviewer and oral examiner. Denture assessment and oral examination forms (Appendix 2) were completed by a trained and calibrated dentist (Kappa =0.78).

3.3 Data processing

Questionnaires, denture assessment and oral examination forms were collated from the interviewer and oral examiner after they finished each day of data collection. Data was entered using SPSS (Statistical Package for the Social Sciences) for Windows (release 17.0, IBM Corporation, Armonk, NY)

3.4 Data analysis

These were imported into STATA for Windows (release 11.0, StataCorp LP 2012). Matched odds ratios were calculated in STATA, taking Chi-square test and Kolmogorov-Smirnov two-sample test for significance value. A test result was deemed significant when the confidence interval did not zero.

3.5 Pilot study

The questionnaire was reviewed by a few dental public health staff. Items for scoring the satisfaction on denture service and denture had used Conbrach's coefficient of Alpha; r=0.82 and 0.83 respectively. Denture assessment and oral examination forms were reviewed by a few prosthodontists.

3.6 Variables

3.6.1 Dependent Variables

3.6.1.1 Provider

-Type of denture provider: Non-dentist and dentist

- Mode of delivery:

Mobile service for ND was denture wearer's accommodation or market.

Mobile service for dentist was extended dental out-patient-department (OPD) of sub-district health promotion hospital.

Non-mobile service for ND was non-dentist's accommodation.

Non-mobile service for dentist was government hospital or private clinic.

3.6.1.2 Procedure interval:

- The number of visits from the preliminary impression up to the complete denture delivery visit was grouped into 6 groups: 1, 2, 3, 4, 5 and more than 5 visits.

- The number of visits from the preliminary impression up to the partial denture delivery visit was grouped into 3 groups: 1, 2, and more than 2 visits.

- The duration from the preliminary impression visit up to denture delivery visit was grouped 3 groups: Immediately at point of service, within a week, within a month, and longer than a month.

3.6.1.3 Satisfaction on denture

Satisfaction questionnaire was modified according to patient's denture satisfaction by Bolender et al (Bolender, Swoope and Smith, 1969). Denture wearer rated their satisfaction on each denture. Rating scale has 5 levels: 5-very satisfied, 4-satisfied, 3- sort of satisfactory, 2-dissatisfied, and 1-very dissatisfied. The satisfaction in denture quality is divided into 7 items and 3 parts for each denture which were

Social appearance: appearance and no bad odour/taste

Function: ability to chew, ability to speak and retention

Discomfort: no pain and overall comfort

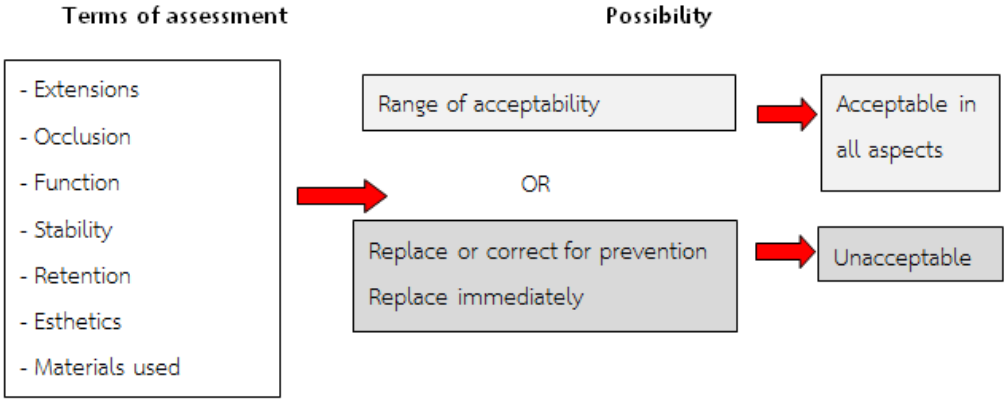
3.6.1.4 Evaluated denture status

All types of denture obtained from ND will be considered as removable denture because real fixed prosthesis has to be done by dentist so removable denture fixed with self-cured acrylic resin or wire tied by ND will be considered as one type of non-professional technique in removable denture.

- *Evaluated pieces of denture:* modified from the guideline of the CDA (California Dental Association) system for follow-up of removable prostheses. Evaluation will be done separately on upper and lower denture. The score of term of assessment will be graded and judged by dentist again for possibility and rating (scoring modified from criteria of clinical evaluating removable denture by Tuominen in 2003). Scoring of each criteria in each topic was dichotomous: 1-acceptable and 0-unacceptable. A denture had to pass all criteria to be acceptable in that topic. Criterion in 7 topics were as follow

Assessment topic	Upper denture		Lower denture	
	Partial	Complete	Partial	Complete
Overall retention				
- open mouth 20 mm, denture still in place	/	/	o	o
- denture still in place when pulling in vertical direction	/	/	/	/
- denture place when pulling in horizontal direction	/	/	/	/
- denture still in place when lifting the tongue	o	o	/	/
- patient can take off and wear denture by him/herself	/	/	/	/
Extension of border				
- denture in place not floating in the mouth	/	/	/	/
- posterior border ended before fovea palatinine and	/	/	o	o
humular notch	o	o	/	/
- posterior border ended before retromolar pad	/	o	/	o
- not higher than height of contour of natural teeth	/	o	/	o
- not terminate at the proximal of teeth	/	/	/	/
- no sharp edge				
General stability				
- no rocking action when apply force on the occlusal	/	/	/	/
table of each side	/	/	/	/
- denture in place when patient grinding				
Esthetics				
- natural gingival appearance	/	/	/	/
- proper length of incisal edge of anterior artificial teeth	/	/	/	/
- color of artificial teeth harmonized with adjacent teeth	/	/	/	/
Attrition of artificial teeth				
- no severe attrition of artificial teeth	/	/	/	/
Materials				
- no porous, rough surface, opaque surface	/	/	/	/
- artificial teeth should not be self-cured acrylic resin	/	/	/	/
Function				
- denture still in place when chewing	/	/	/	/
- Fully occluded in maximum intercuspation position	/	/	/	/
- no sliding on functioning	/	/	/	/

O denotes no assessment in that topic



- Evaluated oral mucosa near the denture: Have oral mucous membrane lesion denture stomatitis Newton type 1,2,3 or not and have Epulis fissuratum or not

- Edentulous areas were examined for untreated retained roots which were covered by denture.

- Evaluated number and position of artificial teeth on current denture where categories into one segment for having only anterior or posterior segment and both segment for having anterior and posterior segments.

3.6.1.5 Satisfaction in denture service

Topics were modified based on behavioral model of health services utilization by Andersen in 1995. There were 13 items 7 topics. Rating scale has 5 levels: 5-very satisfied, 4-satisfied, 3- sort of satisfactory, 2-dissatisfied, and 1-very dissatisfied. Details of each topics was as follow

Accessibility: Working time

Expense and mode of transportation: transportation, transportation fee

Denture process: queue, procedure duration

Denture wearer-provider relationship: Familiarity, taking care by denture provider

Necessary information providing: Explaining during hands-on, caring at home instruction

Payment for denture: Denture fee

Self-percieved quality of care: Skill, instrument cleanliness, total quality of care

3.6.2 Independent Variables

3.6.2.1 Age was categorized into 2 groups, first starting with age 18 to 64 years old and second group, 65 years old and above

3.6.2.2 Gender was dichotomous: male or female.

3.6.2.3 Educational level attainment was grouped into

Non-formal: none and below primary

Primary: primary level

Above primary: secondary, high school, vocational, and undergraduate and upper.

3.6.2.4 Working status was grouped into

Agriculture: agriculture

Economically inactive: housewife and retirement

Other: professional & manager, service & clerk, trade, agriculture, labor,

3.6.2.5 Individual monthly income was exactly individual's average monthly income including yearly income and financing which is grouped by national poverty line of Thailand 2013 at 2,572 THB into 2 groups: Up to national poverty line and above.

3.6.2.6 Area of residency: non-municipal and municipal area

3.6.2.7 Public health insurance is UC, CSMBS, SSS, none and other

3.6.2.8 Waiting time was waiting time interval before preliminary impression visit was grouped 3 groups: Immediately at point of service, within a week, longer than a week.

3.6.2.9 Denture fee is cost of latest denture in Thai baht.

3.6.2.10 Source of provider's information was a source where or to whom denture wearer get the information about latest denture provider. It consists of 6 items 3 groups:

Group 1: family member and neighbor

Group 2: health personnel and provider

Group 3: advertising in market and other source

3.6.2.11 Content of information was about latest denture provider which denture wearer got from information source composing of certain working hours, mode of delivery (nearby accommodation), short queue or waiting list, acceptable time consume, denture fabrication achieve standard procedure, acceptable out-of-pocket payments, pay by installments, negotiable price, negotiable design, good personal skill, familiarity, and have license.

3.6.2.12 Professional prosthesis need was the need of dentist for replacing missing teeth and will be illustrated with number and position of prosthesis then categories into one segment for having only anterior or posterior segment on each arch and both segment for having anterior and posterior segments on each arch.

3.6.2.13 Percieved need is the demand of denture wearer for denture consists of :

- Number and position of needed artificial teeth replacement which was asked from sample for each position then categories into one segment for having only anterior or posterior segment on each arch and both segment for having anterior and posterior segments on each arch.

- Primary reason for obtaining the recent denture: to improve social appearance, to improve chewing ability, to improve speaking ability, need of relatives, easy-to-access.

3.6.2.14 Aspects regarding to select providers were opened-ended question. Answers were categorized into 6 groups: accessibility, willingness to pay out-of – pocket /benefit package of health insurance, short period of time for denture fabrication, personal satisfaction of past experience in obtaining denture, and provider's characteristics, recommendation or peer's influence.

3.7 Budget

Total amount	39,999.80	Baht
- Photocopies	4,668	Baht
- Transportation fee for samples	25,800	Baht
- Collecting data fee for interviewer	6,600	Baht
- Denture cleanser for samples	2,931.80	Baht

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CHAPTER IV

RESULTS

Between October 2014 and April 2015, 165/180 eligible denture wearers obtained denture from ND (cases) and 688/716 denture wearers obtained denture from dentist (controls) were determined to participate in this study, resulting in a 95% response rate. Fifteen denture wearers obtained denture from ND were then subsequently lost to the study: two due to the non-participation in denture assessment, three were excluded as their dentures did not meet the criteria of obtained from denture provider not more than two years, five for did not use their denture, four loss their denture and one for severe broken denture. For control group, denture wearers obtained denture from dentist lost to the study were twenty eight controls which twenty were excluded because their dentures obtained more than two years, three did not allow to assess their dentures and five did not complete the questionnaire. Therefore a total of 165 denture wearers obtained denture from ND and 688 denture wearers obtained denture from dentist were entered by SPSS version 17.0 and analyzed by STATA version 10.

The results were divided into 3 parts based on the objectives of the study. Part one describes population characteristics (underlying determinant) associated with the use of non-dentist denture service among Thai denture wearers in comparison to dentist denture service. Second, outcome of services provided by ND and dentist based on characteristics and satisfaction on denture service and denture which illustrates in second part of this chapter. Last part presents association of determinants and acceptable denture characteristics, and type of provider.

4.1. Population characteristics

Ratio of denture wearers obtained denture from ND and from dentist is 1:4.17. Population characteristics are composed of predisposing factor, enabling factor and denture need.

4.1.1 Predisposing factors

Average age of denture wearers obtained denture from ND was lower than those obtained denture from dentist (60.4±13.6 and 64.9±10.8 years old respectively). Approximately 60 percent were female in both groups. Majority of both group had no education beyond primary school. Economically inactive was the majority of both groups. Over half of each group had individual monthly income under national-poverty line of Thailand 2013 and denture wearers obtained denture from ND had higher ratio of individual monthly income (Table 2).

4.1.2 Enabling factors

Table 3 shows that denture wearers obtained denture from ND were more likely to live in non-municipal area than those obtained denture from dentist. Nine-tenths of denture wearers obtained any kind of denture from ND had no waiting time, the process started immediately on the first day of meeting with ND. On the other hand, approximately half of denture wearers obtained denture from dentist in the hospital waited longer than a week to be taken an impression. Meanwhile, over ninety percentages on both group had Universal Coverage scheme. The main source of provider information preceded to obtain denture from ND was family members or peers who experienced denture services before which contradict to control group. Information about denture provider and service became self-perception of denture wearer prior to seeking denture services. Those group obtained ND denture percieved that place of service was nearby or at their accommodation, percieved out-of-pocket

payments for denture is acceptable and negotiable. Other group thought about denture procedure achieved standard and could negotiate about shade of artificial tooth.

Ratio of denture wearers paid out-of-pocket for denture fee was not different between ND and dentist group except for a pair of partial denture (Table 4). There was not a difference between mobile and non-mobile ND group. It is remarkable that denture wearers obtained denture from extended OPD pay nothing for denture fee except one case for a piece of partial and complete denture (Table 4).

4.1.3 Denture need

To improve chewing ability was the highest primary reason for obtaining denture from ND which was approximately a half whereas of those using dentist denture services was nearly three-fourth. For ND group, to improve social appearance was the second reason for utilizing denture service which was more than forty percentages of all meanwhile only seventeen percentages for dentist group was the same reason. By the way, the underlying reason to utilize ND denture service was short period of denture making process and familiarity of ND but reason in dentist service user group was free of charge from benefit package of health insurance (Table 5).

Table 6 illustrates that professional needs of denture wearers obtained denture were fulfilled by dentist more than ND except for single segment on upper arch and no case replaced only on upper posterior segment.

4.2 Denture service characteristics

Table 7 shows that denture wearers obtained many more partial dentures than complete dentures. There were the differences of time consuming to obtain denture. Over four-fifths of denture wearers obtained any kind of denture from ND

within a week whereas nine-tenths of those obtained denture from dentist within or longer than a month. Over three-fifths of denture wearers met ND only one time to obtain denture meanwhile seven-tenths of those obtained denture from dentist used at least three visits for any types of removable acrylic denture. Regarding within ND group, there were not differences in duration and number of visits for all type of denture except for a single partial denture. While in dentist group, a single denture obtained from extended OPD was spent more visits than from public facilities and a pair of partial denture obtained from extended OPD was spent longer fabricating period than from public facilities.

4.3 Outcomes of denture service

4.3.1 Satisfaction on denture service

There were not differences between self-satisfaction assessed score of denture wearers obtained denture from ND and from dentist except provided information and expenditure for denture aspects (Table 8). The same result was found within the same group on every aspects of denture satisfaction. Top three means on the rank list regarding satisfaction score of denture wearers obtained denture from ND-mobile service were towards denture process, accessibility, expense and transportation fee which were different from non-mobile service: accessibility, denture wearer-provider relationship, and denture process. Necessary information aspect had the lowest mean for both mode of delivery. While, accessibility aspect had the highest mean of satisfaction score whereas payment for denture was second order in ranking and denture wearer-provider relationship was the last aspect in first three ranking of means among denture wearers obtained denture from dentist-mobile service. While the top 3 on the mean of satisfaction score of denture wearers obtained denture from dentist at hospital, the first on rank was payment for denture aspect, second was denture wearer-provider relationship aspect and the third in

ranking order was accessibility. The lowest mean was denture process at both mode of delivery.

4.3.2 Denture characteristics

Malpractices were found in denture obtained from ND. There were non-professional techniques to retain denture in place and coverage of retained root. The most popular non-professional technique used for partial denture Is applying self-cured acrylic at the proximal surface of natural teeth and artificial denture which is found in 36 cases, ties wire in 1 case and suction disc on the palatal surface of denture in 1 case. Suction disc also found on upper complete denture 1 case. Moreover untreated retained root was found beneath denture: partial denture 37 cases and complete denture 3 cases.

There was no denture stomatitis and Epulis Fissuratum adjacent or under denture obtained in both groups.

The assessment of denture characteristics is illustrated in Table 9. For overall retention aspect, the highest percentage of acceptable denture was upper complete denture in each group. Lower complete denture has the highest percentage of acceptable denture in each group for extension of border meanwhile upper partial denture was the highest acceptable denture in each group for function opposing natural teeth. On the other hand, for extension of border, lower partial denture has the lowest percentage of acceptable denture in each group. Lower complete denture has the lowest percentage of acceptable denture in each group for general stability and lower partial denture was the lowest acceptable denture in each group for materials aspect. The last lowest acceptable denture in each group was upper denture for function opposing to artificial teeth aspect.

Denture characteristics of partial dentures fabricated by dentist were more acceptable than by ND in all aspects except stability aspect of lower partial denture. Meanwhile for complete denture, there were not differences between ND and dentist group in all aspects except esthetics and material (Table 9). Regarding within ND group, denture characteristics of partial denture obtained from mobile service were not different from non-mobile service except extension of border in upper partial denture, esthetics in upper and lower partial denture, and material of lower partial denture.

4.3.3 Satisfaction on denture

All of self-satisfaction assessed score towards denture characteristics of denture wearers obtained denture from ND were lower than those obtained from dentist for all kind of denture (Table 10). The highest score of denture obtained from ND was score towards social appearance of upper and lower complete denture. The same results were found among dentures obtained from dentist. On the other, the lowest score of denture obtained from ND was score towards social appearance of lower partial denture. Among score of denture obtained from dentist, function aspect of lower complete denture was assessed as the lowest score.

4.4 Associated of determinants and acceptable denture characteristics, and type of denture

Logistic regression analysis was done after adjusting for sex, educational level attainment, work status and public health insurance scheme. The result showed that living in non-municipal area, utilizing mobile-service, knowing information directly from provider, perceiving that served nearby accommodation, accepting out-of –pocket payments for denture, choosing this ND provider because

short period of time consuming for denture fabrication and fabricating a pair of partial denture with in one or two visits accounted for ND denture services utilization. Nevertheless participants with individual monthly income below or at official poverty line, perception of certain working hours, knowing provider's information from family member's or peer's experience, and choosing denture provider because of benefit package of health insurance were less likely to obtain denture from ND (Table 11) .

Acceptable denture characteristics were different according to type of provider. The following acceptable denture characteristics are more likely to be associated with being a denture fabricated by dentist than by ND: overall retention in lower partial and upper complete denture, extension of border in lower partial and upper complete denture, Stability in Upper complete denture, attrition and materials in all kind of denture, and function in lower partial and complete denture. In additional, lower complete denture with acceptable aesthetic aspect tends to be fabricated by ND (Table 12).

Table 2 Proportion with 95%CI of dentures wearers obtained denture from non-dentist and dentist service according to predisposing factors

Predisposing factors (= 1 if yes, = 0 if otherwise)	Denture wearers obtained denture from non-dentist (N=165)	Denture wearers obtained denture from dentist (N=688)
Age Mean ± SD (years old)	60.4±13.6	64.9±10.8
Age group (%)		
Up to 64 years old	59.4 (51.9,66.9)	45.8 (42.1,49.5)
65 years old and above	40.6 (33.1,48.1)	54.2 (50.5,57.9)
Sex (%)		
Male	34.5 (27.3,41.8)	41.0 (37.3,44.7)
Female	65.5 (58.2,72.8)	59.0 (55.3,62.7)
Educational level attainment (%)		
None of formal	10.3 (5.6,15.0)	12.8 (10.3,15.3)
Primary level	60.0 (52.5,67.5)	68.0 (64.5,71.3)
Above primary level	29.7 (22.7,36.7)	19.2 (16.2,22.1)
Work status (%)		
In agricultural sector	34.5 (27.3,41.8)	37.4 (33.7,41.0)
Economically inactive[a]	41.3 (33.7,48.8)	46.1 (42.3,49.8)
Others such as self-employed and in service	24.2 (17.7,30.8)	16.5 (13.8, 19.4)
Individual monthly income up to national poverty line (%)	51.5 (43.9,59.2)*	69.8 (66.3,73.2)

[a] denotes housewife and retirement

* denotes statistical significantly different with chi-square-test at p-value < 0.0**5**

Table 3 Proportion with 95%CI of dentures wearers obtained denture from non-dentist and dentist service according to enabling factors

Enabling factors (= 1 if yes, = 0 if otherwise)	Denture wearers obtained denture from non-dentist (N=165)	Denture wearers obtained denture from dentist (N=688)
Dwellers in non-municipal area (%)	65.5 (58.2,72.7)*	46.7 (42.9,50.4)
No Waiting time before preliminary impression visit (%)		
A single partial denture	98.9 (96.7,101.1)*	15.3 (8.5,22.1)
A pair of partial denture	95.3 (89.0,101.7)*	29.3 (24.8,33.7)
A single or a pair of complete denture	93.9 (85.6,1.2.2)*	19.0 (13.1,24.8)
Public health insurance scheme beneficiaries(%)		
Universal coverage scheme - US	90.3 (85.8,94.8)	92.2 (90.1,94.2)
Social Security Scheme - SSS	1.2 (-0.5,2.9)	0.4 (-0.1,0.9)
Civil Servant Medical Benefit Scheme - CSMBS	8.5 (4.2,12.8)	7.4 (5.5,9.4)
Provider's information sources (%)		
Experienced family members or neighbors	74.5 (67.9,81.2)*	13.7 (11.1,16.2)
Denture provider	20.6 (14.4,26.8)*	79.1 (76.0,82.1)
Denture service information (%)		
Certain working hours	39.4 (31.9,46.9)	36.0 (32.5,39.6)
Mode of delivery (nearby accommodation)	15.2 (9.7,20.6)*	2.0 (0.3,3.1)
Short queue or waiting list	44.8 (37.2,52.5)	49.9 (46.1,53.6)
Acceptable time consume	26.7 (19.9,33.4)	22.5 (19.4,25.7)
Denture fabrication achieve standard procedure	20.6 (14.4,26.8)*	30.2 (26.8,33.7)
Acceptable out-of-pocket payments	49.7 (42.0,57.4)*	18.8 (15.8,21.7)
Pay by installments	3.6 (0.8,6.5)	3.1 (1.8,4.3)
Negotiable price	14.5 (9.1,19.9)*	1.3 (0.5,2,2)
Negotiable design	13.9 (8.6,19.2)*	26.2 (22.9,29.5)
Good personal skill	7.3 (3.3,11.3)	4.2 (2.7,5.7)
Familiarity	1.8 (-0.2,3.9)	2.5 (1.3,3.6)
Have license	0.6 (-0.5,1.8)	1.7 (0.8,2.7)

* denotes statistical significantly different with chi-square-test at p-value < 0.05

Table 4 Proportion with 95%CI of dentures obtained from non-dentist and dentist service according to affordable out-of-pocket payment for denture fee (enabling factor) across mode of delivery

Affordable out-of-pocket payment	Denture wearers obtained denture from non-dentist			Denture wearers obtained denture from dentist		
for denture fee[a] (= 1 if yes, = 0 if otherwise)	Mobile service**	Non-mobile service	Total	Extended OPD***	Public facilities	Total
A piece of partial denture[b]	*(N=54)*	*(N=55)*	*(N=89)*	*(N=0)*	*(N=26)*	*(N=26)*
1 – 1,400 THB	61.8 (51.5,72.1)	70.9 (58.7,83.2)	67.4 (57.5,77.3)	0	57.7 (38.1,77.3)	57.7 (38.1,77.3)
1,401 THB and above	38.2 (27.9,48.5)	29.1 (16.8,41.3)	29.1 (22.7,42.5)	0	42.3 (22.7,61.9)	42.3 (22.7,61.9)
A pair of partial denture	*(N=20)*	*(N=13)*	*(N=33)*	*(N=0)*	*(N=28)*	*(N=28)*
1 – 2,800 THB	65.0 (43.1,86.9)	69.2 (42.6,95.9)	66.7 (30.0,83.3)*	0	28.6 (11.2,46.0)	28.6 (11.2,46.0)
2,801 THB and above	35.0 (13.1,56.9)	30.8 (4.1,57.4)	33.3 (16.7,50.0)	0	71.4 (54.0,88.8)	71.4 (54.0,88.8)
A piece of complete denture	*(N=1)*	*(N=5)*	*(N=6)*	*(N=0)*	*(N=1)*	*(N=1)*
1 – 2,400 THB	0	60.0 (0.06, 120.0)	50.0 (47.1, 104.7)	0	100	100
2,401 THB and above	100	40.0 (-19.9,99.9)	50.0 (47.1, 104.7)	0	0	0
A pair of complete denture	*(N=5)*	*(N=17)*	*(N=22)*	*(N=0)*	*(N=16)*	*(N=16)*
1 – 4,400 THB	80.0 (39.5,120.5)	76.5 (55.0,98.0)	77.3 (58.7,95.8)	0	43.8 (17.8,69.7)	43.8 (17.8,69.7)
4,401 THB and above	20.0 (-20.5,60.5)	23.5 (2.0,45.0)	22.7 (4.2,41.3)	0	56.3 (30.3,82.2)	56.3 (30.3,82.2)
A piece of partial and complete denture	*(N=5)*	*(N=12)*	*(N=15)*	*(N=1)*	*(N=16)*	*(N=17)*
1 –3,800 THB	0	66.7 (37.7,95.7)	53.3 (26.1,80.5)	0	31.3 (6.8,55.7)	29.4 (6.2,52.6)
3,801 THB and above	100	33.3 (4.3,62.3)	46.7 (19.5,73.9)	100	68.8 (44.3,93.2)	70.6 (47.4,93.8)

Table 5 Proportion with 95%CI of dentures wearers obtained denture from non-dentist and dentist service according to denture need

Denture need (= 1 if yes, = 0 if otherwise)	Denture wearers obtained denture from non-dentist (N=165)	Denture wearers obtained denture from dentist (N=688)
Primary reasons for obtaining the recent dentures		
To improve social appearance	42.4 (34.8,50.0)*	17.2 (14.3,20.0)
To improve chewing ability	51.5 (43.9,59.2)	77.9 (74.8,81.0)
Other[a]	6.1 (2.4,9.7)	4.9 (3.3,6.6)
Aspects regarding to selected providers/ where denture obtained		
Accessibility	26.1 (19.3,32.8)	31.8 (28.3,35.3)
Willing to pay for out-of –pocket payment/ benefit package of health insurance	7.3 (3.3,11.3)*	43.3 (39.6,47.0)
Short period of time consuming for denture fabrication	34.5 (27.3,41.8)*	2.2 (1.1,3.3)
Personal satisfaction of past experience in obtaining denture	13.3 (8.1,18.5)	12.5 (10.0,15.0)
Provider's characteristics	10.3 (5.6,18.0)*	3.5 (2.1,4.9)
Recommendation or peer's influence	8.5 (4.2,12.8)	6.7 (4.8,8.6)

a denotes to improve speaking ability, need of relative and easy-to-access

* denotes statistical significantly different with chi-square-test at p-value < 0.05

Table 6 Distribution of dentures wearers obtained denture from non-dentist and dentist service according to number of tooth loss segment (denture need) across tooth substitution

Number of tooth loss segment (denture need)	Denture wearers obtained denture from	
	Non-dentist (N1, PP1, PP2)	Dentist (N1, PP1, PP2)
Either anterior or posterior segment		
Upper arch	12 , 100, 91.6	67 , 84.8, 86.1
Lower arch -	30 , 42.3, 46.5	112 , 60.5, 75.3
Both segments		
Upper arch	121, 80.7, 80.0	572, 96.8, 98.0
Lower arch	59, 72.8, 76.5	486, 95.9, 97.2

N1 denotes number of denture wearers with tooth substitution

PP1 denotes percentage of denture wearers with tooth substitution as of number of denture wearers with professional need

PP2 denotes percentage of denture wearers with tooth substitution as of number of denture wearers with percieved need

Table 7 Proportion with 95%CI of dentures wearers obtained denture from non-dentist and dentist service according to procedure interval across mode of delivery

Procedure interval (= 1 if yes, = 0 if otherwise)	Denture wearers obtained denture from non-dentist (%)			Denture wearers obtained denture from dentist (%)		
	Mobile service	Non-mobile service	Total	Extended OPD	Public facilities	Total
Partial denture	*(N=34)*	*(N=55)*	*(N=89)*	(N=30)	*(N=81)*	*(N=111)*
Either upper or lower arch	54.0 (44.2,63.7)	53.9 (41.5,66.4)	53.9 (46.3,61.6)*	14.5 (9.7,19.3)	16.8 (13.5,20.2)	16.1 (13.4,18.9)
Preliminary impression visit to denture delivery visit						
- Duration						
None	88.2 (77.2,99.3)***	50.9 (37.5,64.3)	65.2 (55.2,75.2)*	0	0	0
Within a week	5.9 (-2.2,14.0)	38.2 (25.1,51.2)	25.8 (16.6,35.0)	0	9.9 (3.3,16.5)	7.2 (2.3,12.1)
Longer than a week	5.9 (-2.2,14.0)	10.9 (2.5,19.3)	9.0 (3.0,15.0)	100	90.1 (84.0,96.7)	92.8 (87.9,97.7)
- Number of visits for denture fabrication						
1 visit	88.2 (77.2,99.3)***	50.9 (37.5,64.3)	65.2 (55.2,75.2)*	0***	0	0
2 visits	8.9 (-0.9,18.6)	41.8 (28.6,55.1)	29.2 (19.7,38.8)	10.0 (-1.0,21.0)	28.4 (18.5,38.3)	23.4 (15.5,31.4)
More than 2 visits	2.9 (-2.9,8.7)	7.3 (0.3,14.2)	5.6 (0.8,10.5)	90.0 (79.0,101.0)	71.6 (61.7,81.5)	76.6 (68.6,84.5)

Table 7 (Cont.)

Procedure interval (= 1 if yes, = 0 if otherwise)	Denture wearers obtained denture from non-dentist (%)			Denture wearers obtained denture from dentist (%)		
	Mobile service	Non-mobile service	Total	Extended OPD	Public facilities	Total
Partial denture *(cont.)*	*(N=9)*	*(N=34)*	*(N=43)*	*(N=140)*	*(N=265)*	*(N-405)*
Both upper or lower arch[a]	14.3 (5.6,23.0)	33.3 (24.1,42.5)	26.1 (19.3,32.8)	67.6 (61.2,74.0)	54.7(50.2,59.1)	58.6(55.0,62.3)
Preliminary impression visit to denture delivery visit						
- Duration						
None	55.6 (21.0,90.0)	26.5 (11.4,41.6)	32.6 (18.3,46.8)*	0***	0	0
Within a week	44.4 (9.9,79.0)	52.9 (35.9,70.0)	51.2 (36.0,66.3)	3.6 (0.5,6.7)	11.4 (7.5,15.3)	8.7 (5.9,11.4)
Longer than a week	0	20.6 (6.6,34.4)	16.3 (5.1,27.5)	96.4 (93.3,99.5)	88.6 (84.8,92.5)	91.3 (88.6,94.1)
- Number of visits for denture fabrication						
1 visit	55.6 (21.0,90.0)	26.5 (11.4,41.6)	32.6 (18.3,46.8)*	0	0	0
2 visits	44.4 (9.9,79.0)	58.8 (42.0,75.7)	55.8 (40.8,70.9)	3.6 (0.5,6.7)	6.8 (3.8,9.9)	5.7 (3.4,8.0)
More than 2 visits	0	14.7 (2.6,26.8)	11.6 (1.9,21.3)	96.4 (93.3,99.5)	93.2 (90.1,96.2)	94.3 (92.0,96.6)

Table 7 (Cont.)

Procedure interval (= 1 if yes, = 0 if otherwise)	Denture wearers obtained denture from non-dentist (%)			Denture wearers obtained denture from dentist (%)		
	Mobile service	Non-mobile service	Total	Extended OPD	Public facilities	Total
Complete denture[b]	(N=20)	(N=15)	(N=35)	(N=37)	(N=137)	(N=174)
	31.7 (20.1,43.3)	12.7 (6.2,19.3)	20.0 (13.9,26.1)	17.9 (12.6,23.1)	28.5 (24.4,32.5)	25.3(22.0,28.4)
Preliminary impression visit to denture delivery visit						
- Duration						
None	85.0 (68.8,101.1)	53.8 (75.7,82.2)	72.7 (57.2,88.2)*	0	0	0
Within a week	10.0 (-3.6,23.7)	30.8 (4.5,57.0)	18.2 (4.7,31.6)	0	5.8 (1.9,9,8)	4.6 (1.5,7.7)
Longer than a week	5.0 (-4.9,14.9)	15.4 (-5.2,35.9)	9.1 (-0.9,19.1)	100	94.2 (90.2,9.1)	95.4 (92.3,98.5)
- Number of visits for denture fabrication						
1 visit	85.0 (68.8,101.1)	53.8 (75.7,82.2)	72.7 (57.2,88.2)*	0	0	0
2 visits	10.0 (-3.6,23.7)	30.8 (4.5,57.0)	18.2 (4.7,31.6)	0	12.4 (6.8,18.0)	9.8 (5.3,14.2)
3 visits	5.0 (-4.9,14.9)	15.4 (-5.2,35.9)	9.1 (-0.9,19.1)	54.1 (37.7,70.4)	52.6 (44.1,61.0)	52.9 (54.4,60.4)
4-5 visits	0	0	0	24.3 (10.2,38.4)	17.3 (11.7,24.8)	19.5 (13.6,25.5)
More than 5 visits	0	0	0	21.6 (8.1,35.4)	16.8 (10.5,23.1)	17.8 (12.1,23.6)

a denotes among denture wearers obtained partial denture from dentist, there were seven denture wearers obtained metal partial denture which is not cover by UC beneficial package and out-of-pocket payment were 1,300 – 10,000 THB. b denotes among samples, there were a few single complete dentures and a few single partial and single complete denture in one mouth. *denotes statistical significantly different between non-dentist and dentist group with chi-square-test at p-value < 0.05 ** denotes statistical significantly different within non-dentist group with chi-square-test at p-value < 0.05 ***denotes statistical significantly different within dentist group with chi-square-test at p-value < 0.05

Table 8 Self-satisfaction assessed (5-Likert scale) of denture wearers obtained denture from non-dentist and dentist service towards various aspects of denture service (mean±SD)

Aspects of denture service utilization (= 1 if yes, = 0 if otherwise)	Denture wearers obtained denture from non-dentist			Denture wearers obtained denture from dentist		
	Mobile services	Non-mobile service	Total	Extended OPD	Public facilities	Total
-Accessibility	4.22±0.70	4.24±0.69	4.23±0.73	4.66±0.56	4.58±0.56	4.61±0.56
-Expenditure and mode of transportation	4.20±0.63	4.05±0.60	4.11±0.61	4.49±0.60	4.49±0.55	4.49±0.57
-Denture process	4.23±0.58	4.12±0.66	4.16±0.63	4.26±0.82	4.23±0.76	4.24±0.77
-Denture wearer-provider relationship	4.12±0.64	4.15±0.65	4.14±0.65	4.52±0.60	4.60±0.54	4.57±0.56
-Provided information	3.85±0.90	3.98±0.73	3.93±0.80*	4.47±0.61	4.52±0.57	4.51±0.58
-Expenditure for denture	3.70±1.13	3.99±0.92	3.88±1.01*	4.63±0.57	4.69±0.53	4.68±0.55
-Self-perceived quality of care	3.94±0.86	4.09±0.65	4.03±0.74	4.57±0.59	4.58±0.51	4.58±0.53

* denotes statistical significantly different between ND and dentist group with Kolmogorov-Smirnov two-sample test at p-value < 0.05

Median of non-dentist and dentist denture service were equal as 4 –satified level for all aspects

Table 9 proportion with 95%CI of denture with acceptable denture characteristics

Acceptable denture Characteristics (= 1 if yes, = 0 if otherwise)		Obtained from non-dentist (%)			Obtained from dentist (%)***
		Mobile service	Non-mobile service	Total	
Overall retention					
Partial denture	- Upper arch	*(N=52)*	*(N=65)*	*(N=117)*	*(N=275)*
		21.2 (9.8,32.5)	32.3 (20.7,43.9)	27.4 (19.2,35.5)*	59.3 (53.4,65.11)
	- Lower arch	*(N=25)*	*(N=28)*	*(N=53)*	*(N=284)*
		8.0 (-3.1,19.1)	21.4 (5.9,37.3)	15.1 (5.1,24.9)*	46.3 (41.0,52.7)
Complete denture	- Upper arch	*(N=5)*	*(N=30)*	*(N=35)*	*(N=576)*
		80.0 (39.4,120,6)	76.7 (60.7,92.6)	77.1 (63.0,91.3)	84.6 (80.9,88.2)
	- Lower arch	*(N=9)*	*(N=21)*	*(N=30)*	*(N=515)*
		22.2 (-7.8,52.3)	14.3 (-1.7,30.3)	16.7 (3.1,30.3)	24.0 (19.2,28.7)
Extension of border					
Partial denture	- Upper arch	43.1 (34.2,61.9)**	72.3 (61.2,83.4)	61.5 (52.7,70.4)*	88.7 (85.0,92.5)
	- Lower arch	23.0 (53.6,90.4)**	67.9 (49.8,85.9)	49.1(35.4,62.7)*	88.7 (85.0,92.5)
Complete denture	- Upper arch	80.0 (39.4,120,6)	83.3 (69.3,97.4)	82.9 (70.1,95.6)	90.7 (87.7,93.6)
	- Lower arch	88.9 (66.2,111.6)	95.2 (85.5,105.0)	93.3 (84.2,102.4)	98.4 (97.0,99.8)
Stability					
Partial denture	- Upper arch	78.8 (67.5,90.2)	73.8 (63.9,4.7)	76.1 (68.3,83.9)*	89.1 (85.4,92.8)
	- Lower arch	80.0 (63.6,96.4)	85.7 (72.2,99.3)	83.0 (72.8,93.2)	88.7 (85.0,92.5)
Complete denture	- Upper arch	80.0 (39.4,120,6)	76.7 (60.7,92.6)	77.1 (63.0,91.3)	83.5 (79.7,87.3)
	- Lower arch	66.7 (32.6,100.8)	61.9 (39.7,84.1)	63.3 (45.7,80.9)	78.9 (74.4,83.5)
Attrition of artificial teeth					
Partial denture	- Upper arch	92.3 (84.9,99.7)	95.4 (90.2,100.6)	94.0 (89.7,98.3)*	100
	- Lower arch	80.0 (63.6,96.4)	92.9 (82.9,102.8)	86.8 (77.6,96.0)*	100
Complete denture	- Upper arch	80.0 (39.4,120,6)	100	97.1 (91.5,102.8)	100
	- Lower arch	77.8 (47.7,107.8)	95.2 (85.5,105.0)	90.0 (79.0,101.0)*	98.7 (97.5,100.0)
Esthetics					
Partial denture	- Upper arch	42.3 (28.6,56.0)**	75.4 (64.7,86.0)	60.7 (51.8,69.6)*	96.4 (94.1,98.6)
	- Lower arch	36.0 (16.3,55.7) **	82.1 (67.496.9)	60.4 (47.0,73.7)*	90.8 (87.5,94.2)
Complete denture	- Upper arch	60.0 (10.2,109.8)	90.0 (79.0,101.0)	85.7 (73.9,97.5)*	96.8 (95.0,98.6)
	- Lower arch	77.8 (47.7,107.8)	85.7 (69.7,101.7)	46.3 (40.8,51.9)*	88.8 (69.7,96.9)

Table 9 (Cont.)

Acceptable denture Characteristics (= 1 if yes, = 0 if otherwise)		Obtained from non-dentist (%)			Obtained from dentist (%)
		Mobile service	Non-mobile service	Total	
Materials					
Partial denture	- Upper arch	40.4 (26.3,54.0)**	61.5 (49.5,73.6)	52.1 (43.0,61.3)*	100
	- Lower arch	24.0 (6.5,41.5)**	60.7 (41.9,79.6)	43.3 (29.9,56.9)*	99.3 (98.3,100.3)
Complete denture	- Upper arch	60.0 (10.2,109.8)	76.7 (60.7,92.6)	74.3 (59.6,89.0)*	100
	- Lower arch	66.7 32.6,100.8)	61.9 (39.7,84.1)	63.3 (45.7,80.9)*	99.4 (98.5,100.2)
Function					
Partial denture	- Upper arch	55.8 (42.0,69.5)	72.3 (61.2,83.4)	65.0 (56.2,73.7)*	88.6 (79.2,88.0)
	- Lower arch	44.0 (23.7,64.3)	71.4 (54.0,88.9)	58.5 (45.0,71.9)*	82.0 (77.6,86.5)
Complete denture	- Upper arch	100	63.3 (45.1,81.5)	63.6 (52.9,84.2)	68.9 (64.3,73.6)
	- Lower arch	77.8 (47.7,107.8)	52.4 (29.5,75.2)	60.0 (42.1,77.9)	66.5 (61.2,71.7)

* denotes statistical significantly different between non-dentist and dentist group with chi-square-test at p-value < 0.05

** denotes statistical significantly different between ND mobile and non-mobile service with chi-square-test at p-value < 0.05

*** denotes there is not statistical different within dentist group

Table 10 Self-satisfaction assessed (5-Likert scale) of denture wearers obtained denture from non-dentist and dentist service towards various aspects of denture (mean±SD)

Aspects of denture (= 1 if yes, = 0 if otherwise)		Obtained from non-dentist	Obtained from dentist
Social appearance			
Partial denture	- Upper arch	3.85±0.80*	4.41±0.59
	- Lower arch	3.63±0.87*	4.33±0.60
Complete denture	- Upper arch	4.04±0.55*	4.42±0.57
	- Lower arch	4.05±0.59*	4.33±0.60
Function			
Partial denture	- Upper arch	3.82±0.72*	4.18±0.72
	- Lower arch	3.71±0.86*	4.16±0.73
Complete denture	- Upper arch	3.90±0.62*	4.13±0.85
	- Lower arch	3.89±0.73*	4.00±0.91
Discomfort			
Partial denture	- Upper arch	3.94±0.79*	4.32±0.74
	- Lower arch	3.72±0.92*	4.14±0.85
Complete denture	- Upper arch	3.99±0.61*	4.28±0.79
	- Lower arch	3.80±0.84*	4.06±0.90

* denotes statistical significantly different with Kolmogorov-Smirnov two-sample test at p-value < 0.05

Table 11 Association of determinants and type of provider

Determinants (= 1 if yes, = 0 if otherwise)	Type of denture provider (non-dentist) Odds ratio(95% CI)
Predisposing factor	
- Work status	1.22 (0.84,1.77)
- Individual monthly income below or at official poverty line	0.44 (0.23,0.81)*
Enabling factor	
- Living in non-municipal area	2.44 (1.41,4.22)*
- Direct Information from providers	4.80 (1.69,13.62)*
- Family member's-/peer's experience	0.27 (0.10,0.84)*
- Content of information	
Certain working hours	0.45 (0.24,0.86)*
Mode of delivery (nearby accommodation)	5.52 (2.02,15.06)*
Short queue or waiting list	1.08 (0.55,2.13)
Acceptable time consume	1.02 (0.49,2.12)
Standard procedure	0.68 (0.34,1.37)
Patients participations in denture design or tooth color selection	0.56 (0.28,1.13)
Acceptable out-of-pocket payments	2.05 (1.15,3.67)*
Denture need	
- To improve social appearance	1.91 (0.68,5.41)
- To Improve chewing/speaking ability	0.75 (0.27,2.05)
- Aspects regarding to selected providers/ where denture obtained	
Accessibility	0.57 (0.23,1.42)
Willing to pay for out-of –pocket payment/ benefit package of health insurance	0.15 (0.05,0.41)*
Short period of time consuming for denture fabrication	7.85 (2.65,23.30)*
Personal satisfaction of past experience in obtaining denture	0.65 (0.24,1.75)
Provider's characteristics	1.85 (0.55,6.14)
Denture service characteristic	
- Facility to obtain denture (mobile service)	2.07 (1.13,3.79)*
Mobile-services (for ND)/ extended dental OPD at sub-district health promotion hospitals (for dentist)	
- Number of visits for partial denture fabrication	11.01 (5.19,23.34)*
Both upper and lower arch not more than 2 visits	

* denotes statistical significantly different at p-value < 0.05

Table 12 Association of acceptable denture characteristics and type of provider

Acceptable denture characteristics (= 1 if yes, = 0 if otherwise)		Type of denture provider (non-dentist) Odds ratio(95% CI)
Overall retention (%)		
Partial denture	- Upper arch	0.62 (0.27 , 1.42)
	- Lower arch	0.20 (0.09 , 0.44)*
Complete denture	- Upper arch	0.26 (0.16 , 0.41)*
	- Lower arch	0.63 (0.23 , 1.72)
Extension of border (%)		
Partial denture	- Upper arch	0.50 (0.19 , 1.28)
	- Lower arch	0.11 (0.06 , 0.21)*
Complete denture	- Upper arch	0..20 (0.12 , 0.35)*
	- Lower arch	0.23 (0.04 , 1.23)
General stability (%)		
Partial denture	- Upper arch	0.67 (0.29 , 1.54)
	- Lower arch	0.62 (0.28 , 1.39)
Complete denture	- Upper arch	0.39 (0.22 , 0.69)*
	- Lower arch	0.46 (0.21 , 1.02)
Attrition of artificial teeth (%)		
Partial denture	- Upper arch	-
	- Lower arch	-
Complete denture	- Upper arch	-
	- Lower arch	0.12 (0.02 , 0.55)*
Esthetics (%)		
Partial denture	- Upper arch	0.20 (0.07 , 0.60)*
	- Lower arch	0.15 (0.08 , 0.30)*
Complete denture	- Upper arch	0.06 (0.03 , 0.12)*
	- Lower arch	5.79 (2.16 , 15.52)*

Table 12 (Cont.)

Acceptable denture Characteristics (= 1 if yes, = 0 if otherwise)		Type of denture provider (non-dentist) Odds ratio(95% CI)
Materials (%)		
Partial denture	- Upper arch	-
	- Lower arch	0.01 (0.001 , 0.02)*
Complete denture	- Upper arch	-
	- Lower arch	0.01 (0.002 , 0.15)*
Function		
Partial denture	- Upper arch	0.09 (0.47 , 2.08)
	- Lower arch	0.31 (0.17 , 0.58)*
Complete denture	- Upper arch	0.36 (0.22 , 0.60)*
	- Lower arch	0.76 (0.35 , 1.63)

* denotes statistical significantly different at p-value < 0.05

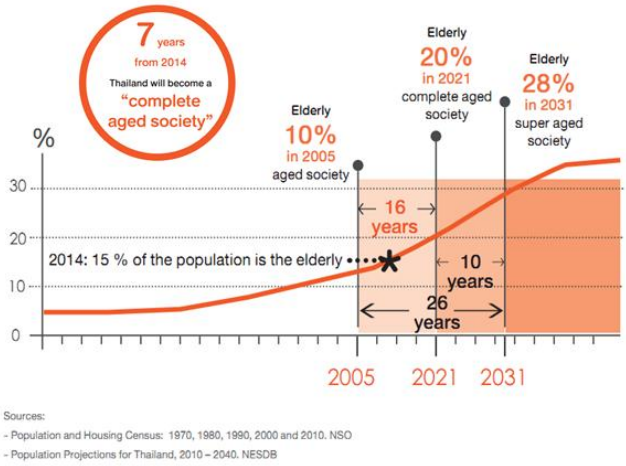
CHAPTER V

DISCUSSION

"Without teeth, nothing you eat will taste good. That will make you unhappy and leave you troubled."

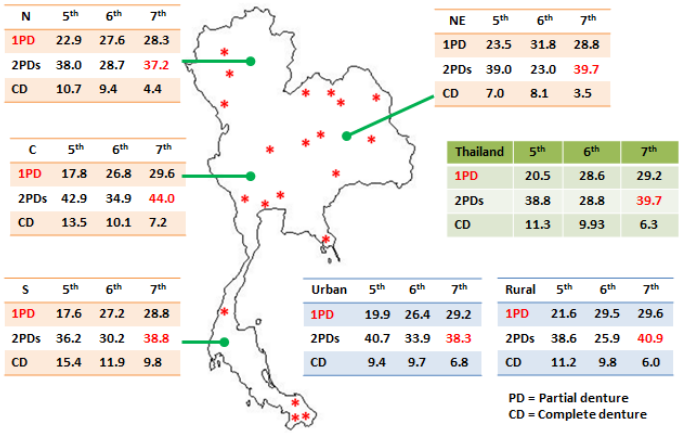
A royal comment from His Majesty the King Bhumibol Adulyadej for denture to replace teeth is the inspiration of royal denture for the elderly in commemoration of His Majesty the King's 80th birthday anniversary project for recovering oral health and fabricating more than 300,000 dentures for elderly. This project is ongoing for more than nine years with the highly intersectoral collaboration and strengthened the dental health care system in primary health care unit (Supranee Dalodom, 2014). However Thailand aged society was continuously increasing since 2005 and by 2021, Thailand will become a complete aged society, which is shown in figure 4 (Foundation of Thai Gerontology Research and Development Institute, 2016). It is time to prepare elderly to live as healthy elderly.

Figure 4 Trends of elderly population in Thailand



Furthermore comparing data from fifth to seventh national oral health survey, permanent tooth loss and denture need of edentulism continuously declined but burden of oral functioning disability in elderly are existed as shows in figure 4 (Bureau of Dental Health, 2013).

Figure 5 Professional denture need (5^{th}, 6^{th},7^{th} oral health survey of Thailand)



Problems in chewing ability, speaking ability and social appearance due to tooth loss are correlated to elderly's well being, thus impairing the elderly's quality of life (Saintrain and Souza, 2012). However, the quality of life of edentulism can be improved within one month by having a complete denture because they can intake more variety of food, improve ability to chew and speak, and social appearance (Shigli and Hebbal, 2010). These impairments and expectations induced the percieved need for and illustrated as a result of socioeconomic inequality in dental care utilization among adults and elderly (Somkotra and Detsomboonrat, 2009; Somkotara, 2013).

5.1 Findings

Prevalence of illegal dental service worldwide is not documented. Data in the introduction illustrates picture of illegal dental service collected from nes and articles on formal websites and journal which reported only a problematic case and illegal issue in overall of dental professional in that country. There is not a statistical report of ND denture user. This underreport is found in Thailand also. ND denture services in Thailand has been reported as illegal, harmful and unhygienic service for more than fifteen years via newspapaer, websites, blog or report of formal health organization. Nonetheless there is not any surveillance to collect data. There are only two academic studies: qualitative study by Suphaluk in 2005 and descriptive study by Pimpa in 2013.

5.1.1 Population characteristics

5.1.1.1 Predisposing factor

Our findings show that denture wearers obtained denture from ND was younger generation. This is inconsistence with the study of Naidu et al in 2003. However this might probably the influence of Royal Denture project which encourages public facilities to serve denture for elderly group. Over a half of denture wearers obtained denture from ND was female. This is correspondent with previous study in Trinidad (Naidu et al, 2003). Moreover people used ND dental service in Trinidad was unpaid or unskilled employees which are in contrast with our finding that those economically inactive were the majority who use ND denture service. Poor people utilized denture service from dentist which is higher than higher income people. This is correspondent with the intervention of including acrylic resin denture service in all public health insurance as to reduce or waive copayments for the poor

and vulnerable group (Attaporn, 2012). Even there is the difference though objective of UC scheme was achieved. Low income group are willing to wait for denture fabrication even it takes a long time, meanwhile people with higher income finds another denture provider to serve their need without considering of it is a dental professional or not. This is correspondent with the study of Somkotra in 2013, that there is inequality in dental care usage after UC implementation. On the other hand, people with higher income used ND denture service and this is not correspondent with previous studies (University of Hong Kong, 1996; Sandesh and Mohapatrs, 2009)

5.1.1.2 Enabling factor

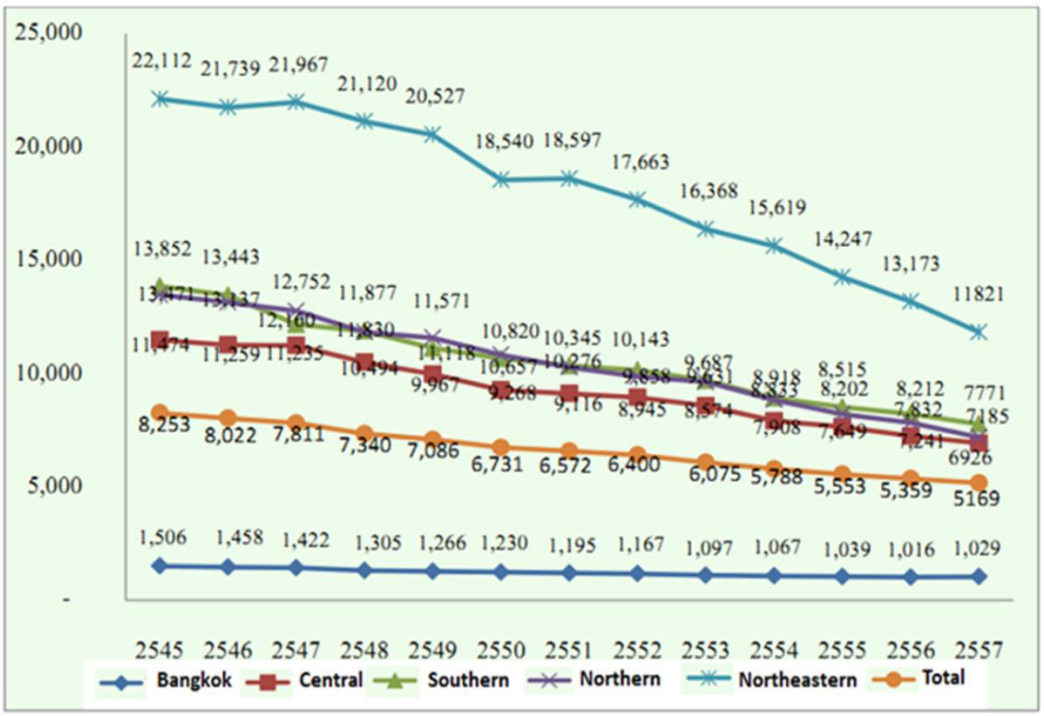
Denture wearers obtained denture from ND were more likely to live in non-municipal area. This is consistent with previous studies (Sandesh and Mohapatra, 2009; Benzian, Jean and van Palenstein Helderman, 2010; Silva and Gamage, 2011). Probably, the main reason is there is not sufficiency of dentist. Denture service in non-municipal area of Thailand is provided mainly by government hospital where it has limited dental workforce. Dental workforce in government hospital consists of dentist, dental hygienist, dental assistant and dental laboratory technician. The data of dental workforce report from the Bureau of Dental Health (2015b) illustrated that overall ratio of dentist is 1:5,169 which is sufficient to care Thai population (suitable ratio for dental care is 1:10,000) and only half of dentist works in public sector (Table 13).

Table 13 Percentage distributions of Dental workforce in Thailand, 2014

Workplace	Dentist (N=12,600)	Dental nurse (N=6,613)	Dental assistant (N-2,222)	Dental laboratory technician (N=92)
Ministry of Public Health	39	98	68	47
Other government sector	12	2	26	32
Private sector	49	-	6	21

The percentage of dentists in Ministry of Public Health working in community hospital is 53.5%, in general hospital is 32.5%, in provincial department is 13.7, and in sub-district health promoting hospital is 0.3%. Regarding ratio of dentist to population in each region: highest ratio is in Bangkok 1:1,029 and lowest ratio is in northeastern region 1:11,821. Furthermore 64.8% of oral prosthodontists work in public sector whereas 19.6% works in community hospital and 14.7% work in general hospital. Maldistribution and insufficiency of dentist in community hospital affects denture service. Early study has shown that too many patients and limited time was the number one obstacles of providing removable acrylic denture in community hospital (Pimpa Junron and Warapan Tanpat-anan, 2003). The consequence is long waiting time and period of denture fabrication. Our data confirms that people with higher income in rural areas with unmet denture need were more likely to utilize ND denture service than those in urban area. They did not satisfy on long queue and period of denture fabrication.

Figure 6 Ratio of dentist to population B.E. 2545-2557



Before utilizing ND denture service, people will collect information of provider. The result shows that people who got information from ND directly are more likely to utilize their service because ND was acquainted with them. This is correspondent with the previous studies (Naidu, Gobin and Newton, 2003). The same observation was found in Hong Kong (University of Hong Kong, 1996), Guyana (Benzian, Jean and van Palenstein Helderman, 2010). The message is that ND denture provider would serve nearby their accommodation or as home-delivery. It is very attractive for denture wearers because of the convenience and saving them transportation time. Moreover out-of-pocket payment for denture is acceptable and negotiable. Individual has to make a decision for affordable out-of-pocket payment trading the more rapid denture service. On the other hand, denture wearers obtained denture from dentist considered the denture procedure with achieved standard and they could negotiate about shade of artificial tooth.

Our result confirms that most of denture wearers obtained from ND had no waiting time, the process started immediately on the first day of meeting with ND. There is not an academic study supporting this topic but there is on-site denture services in India (Sandesh and Mohapatra, 2009), Pakistan (Abbasi, 2012; Nine quacks held in raid on 'Chinese clinics' in Saddar, 2012), and Sri Lanka (Ekanayaka and Samarasinghe, 1989). Meanwhile, waiting time is the problem of dental service in public facilities. Job of dentist in community hospital is not only prosthodontics treatment but also dental care in prevention, promotion and other dental treatment. They have to administrate time schedule and prioritize the problem of their responsible community to deal with suitable solution.

For financial barrier, Thailand launched UC scheme which is very successful for reducing barrier of denture fee but people still use ND because of other reason aside from financial concern. While, out-of-pocket payment for denture fee has no difference between dentures fabricated by ND and dentist.

5.1.1.3 Denture need

Primary reason for getting denture from ND and dentist was to improve chewing ability but the proportion of ND denture user was higer than dentis denture user for reason of improving their social appearance. Moreover, the underlying reasons to utilize ND denture service were short period of denture making process and familiarity of ND. For example, ND denture service was commonly used to improve immediately their social appearance on the same day, especially in the case of having a one segment on the anterior site. However, the reason of using ND service because of familiarity is correspondent with previous studies (Naidu, Gobin and Newton, 2003; Benzian, Jean and van Palenstein, 2010; University of Hongkong, 1996). While, the underlying reason for using dentist service was free of charge from UC beneficiaries.

5.1.2 Denture service characteristics

Non-dentist fabricates more partial dentures than complete dentures. This is probably partial denture is easier and spend less to fabricate time than complete denture. Some ND made denture on site of service and deliver immediately on that day. This is correspondent with previous studies (Sandesh and Mohapatra, 2009; Abbasi, 2012; Nine quacks held in raid on ‘Chinese clinics’ in Saddar, 2012; Ekanayaka and Samarasinghe, 1989). Total time of fabrication is not more than one month which is faster than dentist. Denture wearers are more likely to utilize ND denture

service because ND fabricated a pair of partial denture within one or two visits while most of dentist takes more than two visits to fabricate a pair of denture.

5.1.3 Outcome

5.1.3.1 Satisfaction on denture service

Our study discovered that denture wearers were not satisfied on ND denture service when providing information. They want to know what ND does during denture fabrication process and how to take care of denture at home. They want to self-care for their denture but ND gave no instruction during and after the process. Some sample wore denture obtained from ND did not know how to remove dentures or did not take off their denture at all at night because ND did not give an instruction. And, even they could afford and negotiate denture fee though they still were not satisfied on fee of denture.

Our findings confirm that denture wearers were satisfied on ND-mobile service because of short period of denture process, accessibility, expense and transportation. They were satisfied on denture process which was faster than dentist and do not waste time and money for transportation, and no loss income. This is consistent with previous study by Suphaluk Lertmanorut in 2005. However it is remarkable that median of score is at satisfied level which is equal to all aspect of ND and dentist denture service.

5.1.3.2 Denture characteristics

Denture wearers with problem always leave their denture, correct it by themselves or see a dentist for removal (Pimpa DeeButsee, 2013). Problems are due to non-professional techniques for retaining denture and residual monomer from incompletely polymerization of self-cured acrylic resin. Our study found that most

popular non-professional technique is applying self-cured acrylic resin on proximal surface of artificial teeth and natural teeth or remaining root as in this study. This were observed in previous studies (Hans, Hans and Nagpal, 2014). On the other hand, non-professional techniques are not helping to retain denture in position. Our finding shows that over all retention of partial dentures obtained from ND was lower than those from dentist. The consequences of non-professional techniques are inflammation, infection, pain, swelling, loss of adjacent teeth, and may be cancer. However our study does not found oral lesion from ND denture, it is possible because denture was use no longer than 2 years. The consequences of denture obtained from ND were compensated with the rapidness of procedure and denture wearers were satisfied to utilize it in short term. It is necessary to investigate the consequences of long term ND denture utilization.

Denture obtained from dentist is more acceptable than ND in almost all aspects especially partial denture has to be fabricated with proper designing and techniques. We found that most dentures from ND are under extension of border because ND wants to satisfy denture wearers. While, complete denture fabricated by ND were different from denture made by dentist in terms of material used and esthetics retention which are based on selection of material and technique. Polishing surface of denture from ND is not smooth and clear as from dentist. It looks like incomplete polymerization of acrylic resin.

5.1.3.3 Satisfaction on denture

Denture wearers obtained denture from ND satisfied on denture lower than those obtained from dentist in all aspects. However even denture obtained from ND has less acceptable denture characteristics though the satisfaction score is higher than sort of satisfaction level (scoring is 3). The highest score of denture obtained

was score towards social appearance of complete denture in both groups. This is the first impression of edentulism for belonging a new appearance like a dentate person.

5.2 Suggestion for ND denture service utilization in Thailand

The suggestion to tackle this problem is applying the upstream-downstream concept introduced by John McKinlay in 1998. The metaphor of upstream-downstream to health has helped in understanding the root cause of ND denture services utilization and create suitable for each level. At present, there are no evidence – based interventions to intervene further upstream. We will discuss only the policy involved and give a suggestion as follow

5.2.1 Need assessment

The solution for solving long waiting time and period of denture fabrication problem of dentist denture service is to shift the paradigm of denture need from professional approach to sociodental approach. Denture need assessment in Thailand is generally a professional need even in the national oral health survey. Professional need is a normative need which cannot be fulfilled with limited dental resources. Sudaduang krisdapong (2014) mentioned that one new approach to find out the real need of people is a sociodental approach which was modified as model for analyzing partial denture need for elderly by Srisilapanan and Shsiham, and complete denture need for elderly by Srisilapanan et al. Models have 5 levels of need assessment for partial denture and 4 levels for complete denture. The criterion are part of normative need, low weight (first priority to get denture), impacted with oral health related quality of life, belonging high success rate with oral health care and non-smoking (not assess for complete denture), and affording to pay for transportation and denture fee. People who has the criterion is people with real

need and has tendency to succeed in denture treatment. Percentage of people with partial denture need was reduced from 60.0% with professional approach to 22.2% with sociodental approach and those with complete denture were decreased from 79.7% to 60.7%. It is very interesting to investigate how to simplify this approach because it takes time to assess completely each people. Fortunately, there is support from Thai government for denture fee of Thai citizen with public health insurance.

There are some underlining problems which need further investigation. For example some dentures obtained from ND were placed over untreated remaining roots. This may describe that ND cannot treat remaining roots, ND do not know about mouth preparation before denture fabrication or want to deliver denture without caring of surrounding tissue. And, we found that the reasons of some cases are as follow

- They had an anxiety of pain during or after root removal process.

- They had uncontrolled underlying condition such as uncontrolled Diabetes Mellitus and dental personnel would not remove root until they can control Diabetes mellitus and would not make denture for them if their roots exist.

These reflect that some dental personnel did not have good patient management during dental care process and lacked of holistic care. These unmet normative needs were fulfilled with ND denture provider.

5.2.2 Upstream intervention

Upstream approach includes public policy and intersectoral collaboration. Legal constrains or policy to restrict the sale or promotion of dangerous products are examples of this level approach. Upstream suggestions are as follow

5.2.2.1 Service plan: Ministry of Public Health launched service plan in 2011 to develop quality of health care service system. Service plan started from organizing node satellite for referral of health diseases, cancer, accidental case and new born. Branches of service plan were added up every year. Dental care branch was added up in 2013 (Bureau of Health Administration, 2013). At present, service plan in 2016 has 13 branches and Oral care is 8th. There is one involved and feasible key performance index (KPI): 55% of sub-district health promoting hospital qualified oral health care service in 2017 (Bureau of Health Administration, 2016). It is very useful KPI. Node satellite and seamless referral system are economically effective instrument for managing high cost and complicated treatment such as denture treatment. To compensate the insufficiency of dental resources, re-allocation of dental workforce, instruments are needed. Nevertheless service plan for dental workforce will be done every 5 years and redone every year. This KPI helps us for preparing resources for ND denture service utilization surveillance. Relationship among dental networking will be closer and easy to coordinate. However service plan will support for high cost equipment such as permanent dental unit, some low budget community hospitals had to circulate dental workforce, material, instrument and mobile unit from office to sub-district health promoting hospitals. This phenomenon challenges policy maker in every level. Sub-district health promoting hospital is the primary care unit where it has data of vulnerable, disabled person, and alternative medicine etc and mapping of responsible villages. Health personnel of sub-district health promoting hospital are familiar with native villager. They can extended a helping hand for surveillance of dental social problem such as ND denture service utilization and denture need. Data from surveillance should be sent as feedback to villager and networking for proper management. Moreover they can become a reviewer of denture queue in their responsible area for the real denture need. These roles do not mention in template of KPI. And, surveillance should be

included in KPI of oral health care service plan at least once a year for any dental social problem. Nevertheless, elderly club has many valuable persons with many connections. Leader of health voluntary or elderly club is the key person to communicate the information or story of ND to people nearby. The main supportive activities from service plan are node satellite, seamless referral system, helping in networking, surveillance, and clarifying denture waiting list.

5.2.2.2 Oral health for Thai elderly plan: Bureau of Dental Health made a plan for oral health care of elderly above 59 years old and adult 40-59 years old (Bureau of Dental Health, 2015a) . Plan began from 2012 to 2021 to prepare Thai society to be healthy aged society in the near future because Thailand is an aging society since 2005 and going to be a complete aged society in 2025 (Foundation of Thai Gerontology research and Development Institute, 2014). Ratio of elderly will be one-fourth of total population. Unmet denture need should be fulfilled. Data from seventh Thailand National Oral Health Survey in 2012 shows that elderly with 20 functional teeth was 57.8%, loss of all teeth was 7.2% and complete denture need in 60-74 years old was 2.5% and 80-89 years old was 7.2%. Moreover partial denture need in 35-44 years old was 13.1%. Involved strategies and activities as follow.

1. Development of oral health care model, system and quality strategy: The objectives tackle root causes of ND denture service utilization but details of some main activities did not mention such as improvement of access to care among network. Development of pathway of system goes straight to participatory action of network and people which depend on the context of each area. However it is feasible because the strategy corresponds with service plan in seamless referral system, increase coverage of dental treatment and elderly club activities. Moreover there are family doctors and home health care activities which focus on home visit activity and long term care for elderly. The last group of

activities is development of participatory oral-health-care model of network which is the very effective solution for ND denture service utilization. This model challenges dental professional to intervene denture need with sociodental approach, and send feedback data to every sector for asking to reduce transportation barrier, low weight elderly, smoking habit in community.

2. Research and innovation about artificial teeth and comprehensive care model in geriatric dentistry strategy: Innovation of system or materials or techniques takes time to succeed but success rate is quaranteed. For example, one or three visits complete denture techniques are practical in royal dental unit but dental laboratory technician has to work with dentist all the time in 1-visit complete denture and in second visit of 3-visits complete denture. In real situation, there is no technician to be with dentist all the time though it is very beneficial to simplify complete denture fabricating process. While, Thai artificial teeth will save out-of-pocket payment if patient obtained denture from private clinic. Meanwhile, comprehensive care model is very interesting for maintaining or improving oral health related quality of life of elderly and treating patient with holistic care. It will be role model of another elderly to take care of themselves and influent the next generation in the near future.

3. Development of human resource and geriatric dentistry curriculum strategy: This strategy is very effective for modification of curriculum. One related cause of long period of denture fabrication is insufficiency of dental laboratory technician (Table 11). There are only 3 institution which produced approximately 40 persons in 2011. It is a 2-year curriculum which consists of fixed and removable prostheses. It is time to rethink about dental technician. Only the ability to manufacture removable denture is required to solve the insufficiency problem and to meet denture demand in UC patient. Finally, our findings show that quality of

denture service and denture obtained from ND are not bad. Moreover denture wearers were satisfied on some kind of denture. However it is the limitation of our study for selecting sample with denture not more than 2-year usage to control confounding the effect of usage duration. It is very sensitive for every sector to re-evaluate this matter with evidence-based dentistry not with professionalism perspective.

4. Administration, data base development, supporting and monitoring strategy: This information management strategy covers all data requirement by development of Geriatric Information Technology Management System (GDIS), geriatric oral health surveillance, and monitoring system. It is feasible to succeed and useful for collecting data of ND denture utilization surveillance. Distribution of dental resources will be prioritized and re-allocated with dental treatment need including denture need.

5.2.2.3 Pooled and arranged logistics of laboratory: Denture is high cost treatment. Most of expenditure is paying for laboratory process and it is incrementing every year (Attaporn limpanyalerd, 2012). Dentist trusts in big laboratory in the capital more than in rural area. Sainamtip dental laboratory in Bangkok received removable denture order from rural area because of documentary and denture quality reasons (The Dental Council, 2009: Online). Thai government should collect the data and analyze for setting up node satellite for the nearest laboratory. Registered, standardized the quality of denture manufacturing process, and arranged logistics of sending denture for high efficiency. Finally, each province should have at least 1 dental laboratory technician in provincial or general hospital.

5.2.2.4 Restricting Place when using materials for denture fabrication: Essential materials consist of heated or cold cured type of monomer and tissue

shaded powders polymethylmethacrylate acrylic, and artificial teeth. These materials have to be utilized for denture purpose only in a registered dental laboratory or dental clinic. This study indicates that ND delivered removable acrylic denture at their home or denture wearers' accommodation where is not the proper place to service.

5.2.2.5 Setting up special course to train dental technician for removable acrylic denture: The shortage of dental laboratory technician make the duration of denture fabrication by dentist longer which did not satisfy the denture wearers in this study. Dentist has to find the suitable dental laboratory but sometime that laboratory is far away from clinic. This can be achieved by reducing the 2-year curriculum to 1-year curriculum with withdraw subject about fixed prosthesis. This is a special curriculum with limited generation. Before producing this new type of technician, policy maker must understand firstly the situation of dental laboratory system and logistics for estimating the proper number of new technician.

5.2.3 Midstream intervention

This level focuses on helping people cope with their risky behaviors, try to change the risk level of people and improve their ability to deal with poor social conditions Examples of interventions are community resilience and social capital building support programs, training in skills development, practical assistance in the form of subsidies, and incentives to promote adaption of positive social actions such as conditional cash payments for tacking girls to school in developing world counties. Downstream interventions are as follow

5.2.3.1 Reprioritizing waiting list with sociodental approach: This new approach will help dentist to prioritize patient in long waiting list. The assessment of

each level can be participated by network except normative need assessment. Accessible/ non-accessible need can be changed by network coordination.

5.2.3.2 Setting up knowledge base: High technology is used to investigate the new knowledge and search for the answer. It looks like a normal way of new generation. The knowledge base of denture service utilization will be the visual community of denture wearers or young generation where they can read the information about denture service, find the solution on their denture problem, talk with dentist and share their good or bad experiences on denture service usage.

5.2.3.3 Communicating via native mediator: Our study confirms that they were likely to utilize ND denture services when individuals got information from ND denture provider directly where mobile service can serve this point. This corresponds with the findings of previous studies (Naidu, Gobin and Newton, 2003 ; University of Hong Kong, 1996; Benzian, Jean and van Palenstein Helderman, 2010; Mor fun Thai dan , 2007: Online) that villagers from small communities got information directly from ND and they felt comfortable to use ND denture service because ND is a relative or neighbor and they feel that ND was “one of their own”. To deal with this problem point of views, our study illustrates the significance of family member and peer that past experience on denture service utilization with them protected individuals from using ND denture service. This finding is supported by general communication concept that effective communication is done with same level of language in suitable time. To educate individuals about ND denture services, media should base on the true story of same level SES peers with problematic ND denture service experience, use native languages to describe story and distribute to every sub-district unit. This process should be repeated with patient who obtained a good denture fabricated by dentist. These two types of media should be launched at the same time to create the different images or comparisons between two services.

5.2.4 Downstream intervention

To deal with the straight health problem, downstream intervention focuses on deploying tactical interventions, projects or campaigns to affect specific behaviors related to social challenges or problems. Examples of interventions would be treatment of health problems, and patient education etc.

5.2.4.1 Maintaining the good quality of dental care: this study found that denture wearers got the information of denture service from experienced family member and peers then they will make a decision to choose provider. This is the key message to encourage individual with denture-percieved need for dentist denture utilization. Good dental care reflects to another kind of dental treatment. Furthermore don't forget to make an appointment. Our study found that denture wearers want to know exact time of appointment

5.2.4.2 Royal denture project: One outcome of this project is 35,000 complete dentures for elderly per year which is an accomplishment from the coordination of network. This project increases access to denture service because dentist has to move from hospital to work at sub-district health promoting hospital. Furthermore this result is consistent with the result of assessment study for general characteristics of population (Dalodom, Weerachai, WetWithee and Jianmaneechotechai, 2008) so this project is very advantage to the poor.

5.2.4.3 Out-of-pocket payment for removing or correcting problematic denture obtained from ND: List of treatment covered by all 3 public health insurance scheme do not cover the expenses of problematic denture removal or correction. After treatment, patient may tell their neighbors about bad outcome of ND denture service and out-of-pocket payment for removal or correcting. This is the protective effect for individual who is seeking for denture service in this study.

5.2.4.4 Setting up surveillance for ND denture service: There is only two academic evidence (Pimpa Deebutsee, 2013; Suphaluk Lertmanore, 2005) and no formal report about ND denture service utilization. Surveillance is used to control ND denture service utilization by monitoring risk area. Step of surveillance is states below:

- Collecting number of cases at that event, area of residency, area of service, time of service, type of denture, problem, usage of non-professional techniques and denture fee

- Grouping and analysis of data to map areas of ND denture services which are different for mobile and non-mobile services

- Reporting results and map of ND denture service coverage to policy makers, stake holder, network and people in risk area

- Controlling ND denture service utilization with suggestion in this study and repeated for collecting data

CHAPTER VI

CONCLUSION

This study illustrates the picture of ND denture service utilization in Thailand. our study confirms that factors are more likely to be associated with ND denture service utilization: living in non-municipal area, utilizing mobile-service, knowing information directly from provider, perceiving that served nearby accommodation, accepting out-of –pocket payments for denture, choosing this ND provider because short period of time consuming for denture fabrication and ND fabricated a pair of partial denture within one or two visits. Nevertheless participants with individual monthly income below or at official poverty line, perception of certain working hours, knowing provider's information from family member's or peer's experience, and choosing denture provider because of benefit package of health insurance were less likely to obtain denture from ND. Even denture obtained from ND are less acceptable denture characteristics than those from dentist though denture wearers satisfied on ND denture service because of short period of denture fabrication and service nearby their accommodation.

This study suggests to apply the following interventions, which are the upstream, midstream and downstream approach. For upstream approach includes using service plan, oral health for Thai elderly plan, pooled and arranged logistics of dental laboratory, restricting place when using materials for denture fabrication and setting up special course to train dental technician for removable acrylic denture. While midstream approach includes reprioritizing waiting list with sociodental approach, setting up knowledge base and communicating via native mediator. And downstream approach includes tactical interventions, projects or campaigns about

maintaining the good quality of dental care, Royal denture project, removal of problematic ND denture which is not covered by public health insurances and setting up surveillance for ND denture services.

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APPENDIX

Questionnaire and examination form of Non-dentist denture services utilization in Thailand: related factors and outcomes research

ID..... Date of birth...../...../.....

Name of this sample recruiter ..... Telephone.....

(Mark with / in ( ) and fill in the blank)

Part 1 General Data (Denture no longer than 2 years)

1) Chronological Age .....years old

2) Sex ( ) 1- Male ( ) 2- female.

3) Educational level attainment

( ) 1- None ( ) 2- Below primary school ( ) 3- Primary school

( ) 4- Secondary school ( ) 5- High school

( ) 6- Vocational school ( ) 7- Undergraduate and upper

4) Occupation

( ) 1- Professional & Manager ( ) 2- Service & Clerk ( ) 3- Trade

( ) 4- Agriculture ( ) 5- Labor ( ) 6- Housewife

( ) 7- Retirement ( ) 8- Others (identify).....

5) individual monthly income ..... THB

6) Health insurance

( ) 1- UC ( ) 2- CSMBS ( ) 3- SSS ( ) 4- None ( ) 5- Other (identify).....

7) Does your health insurance cover denture

( ) 1- No ( ) 2- Yes ( ) 3- Don't know

Part 2 Denture service characteristics

1) Which arch you are wearing denture at present?

( ) 1- Upper ( ) 2- Lower ( ) 3- Both

2) What is your reason for wearing this present denture? (Ranking 1-3)

( ) 1- For social appearance ( ) 2- To improve chewing ability

( ) 3- To improve speaking ability ( ) 4- Need of relatives

( ) 5- Easy-to-access ( ) 6- Other (identify).....

3) To whom did you obtain your present denture?

( ) 1- Name..... ( ) 2- Don't know

4) Which source of information did you learn about denture provider?

(Can be more than 1 answer)

( ) 1- Advertisement brochure or board ( ) 2- Relatives / Family members

( ) 3- Neighbor ( ) 4- Health personnel ( ) 5- Provider ( ) 6- Other (Identify).....

5) Did you confirm the information before going that provider (Can be more than 1 answer)

( ) 1- No, trust in source of information ( ) 2- No, have no time

( ) 3- Yes, with experienced denture wearer ( ) 4- Yes, with provider directly

( ) 5- Other (identify).....

Did you **know these information before obtaining denture services and how about them**

6) Working time ( ) 1- Yes, on..... ( ) 2- No

7) Transportation method ( ) 1- Yes, by..... ( ) 2- No

8) Your health insurance cover denture ( ) 1- Yes ( ) 2- No ( ) 3- Don't know

9) Denture fee ( ) 1- Expensive ( ) 2- Not expensive ( ) 3- Don't know

10) Pay by installment ( ) 1- Daily ( ) 2- Monthly ( ) 3 –Other..... ( ) 4- Don't know

11) Denture fee can be negotiated ( ) 1- Yes ( ) 2- No ( ) 3- Don't know

12) Denture design can be negotiated ( ) 1- Yes ( ) 2- No ( ) 3- Don't know

13) Denture queue ( ) 1- Long ( ) 2- Short ( ) 3- Don't know

14) Skill of provider ( ) 1- (identify)..... ( ) 2- Don't know

15) Standard of procedure ( ) 1- Okay ( ) 2- No ( ) 3- Don't know

16) duration of denture processing ( ) 1- Rapid ( ) 2 - Slow ( ) 3- Don't know

17) License to deliver denture ( ) 1- Have ( ) 2 – Don't have ( ) 3- Don't know

18) Provider's characteristicsว ( ) 1- (identify)..... ( ) 2- Don't know

19) Other information ( ) 1- (identify)..... ( ) 2- Don't know

From the information above, what are your reasons for choosing this provider?

20) First reason.....

21) Second reason.....

22) Third reason.....

23) Where did you obtain present denture

( ) 1- Government hospital..... ( ) 2- Dentist mobile unit

( ) 3- Private dental clinic..... ( ) 4- Market ( ) 5- ND's house

( ) 6- Your accommodation ( ) 7- Other (identify).....

24) When were you taken preliminary impression after seeing denture provider at first time

( ) 1- Immediately ( ) 2- 1 day ( ) 3- 2 days to 1 week ( ) 4- 8 days to 3 weeks

( ) 5- 22 days to 1 month ( ) 6- 1 month 1 day to 2 months ( ) 7- more than 2 months.....

25) How long did you wait since preliminary impression visit up to denture delivery visit

( ) 1- Immediately ( ) 2- 1 day ( ) 3- 2 days to 1 week ( ) 4- 8 days to 3 weeks

( ) 5- 22 days to 1 month ( ) 6- 1 month 1 day to 2 months ( ) 7- more than 2 months.....

26) Number of visit.....

27) How did you pay for denture fee?

( ) 1- Free of charge including in public health insurance

( ) 2- One-time payment .....THB

( ) 3- Pay by installment ( ) 4- Other (identify).....

28) Do you know how/where your denture provider learned denture fabrication?

( ) 1- Don't know ( ) 2- Faculty of dentistry ( ) 3- From parents

( ) 4- By him/herself ( ) 5- Previous dental auxiliary (identify).....

( ) 6- Other (identify).....

29) Do you know where he/she lived?

( ) 1- Don't know ( ) 2- Same district ( ) 3- Another district ( ) 4- Aboard.....

30) Do you think he/she is a dentist?

( ) 1- Yes ( ) 2- No ( ) 3- Cannot identify (skip 38)

31) What makes you to think that he/she is dentist (can be more than 1)

( ) 1- Workplace.....

( ) 2- Costume.....

( ) 3- Conversation manner.....

( ) 4- Denture procedure and instruments.....

( ) 5- Informal contact ( ) 6- License showing

( ) 7- Other (Identify).....

32) In the opinion of interviewer, is he/she is a dentist?

( ) 1- Dentist.....

( ) 2- Non-dentist.....

Part 3 Satisfaction on denture service

(Mark with /for satisfaction level of sample)

Topic	Very satisfied (5)	Satisfied (4)	Sort of satisfactory (3)	Dissatisfied (2)	Very dissatisfied (1)
Accessibility 1. Working time					
Expense and mode of transportation 2.Transportation					
3.Transportation fee					
Denture process 4.Queue					
5.Procedure duration					
Denture wearer-provider relationship: 6.Familiarity,					
7.Taking care by denture provider during hand-on					
Providing necessary information 8. Explaining during hands-on					
9.caring at home instruction					
Payment for denture 10.Denture fee					
Self-percieved quality of care 11.Skill					
12.Instrument cleanliness					
13.Total quality of care					

Part 4 Satisfaction on denture

(Mark with /for satisfaction level of sample)

Function

Topic	Very satisfied (5)	Satisfied (4)	Sort of satisfactory (3)	Dissatisfied (2)	Very dissatisfied (1)
1.Ability to chew					
2.Ability to speak					
3. Total score	Don't ask				

Upper arch

Topic	Very satisfied (5)	Satisfied (4)	Sort of satisfactory (3)	Dissatisfied (2)	Very dissatisfied (1)
4.Appearance					
5.Retention					
6.No pain					
7.No bad odor /taste					
8.Overall comfort					
9.Total score	Don't ask				

Lower arch

Topic	Very satisfied (5)	Satisfied (4)	Sort of satisfactory (3)	Dissatisfied (2)	Very dissatisfied (1)
10.Appearance					
11.Retention					
12.No pain					
13.No bad odor /taste					
14.Overall comfort					
15.Total score	Don't ask				

Part 5 Denture status

Upper arch

1) Type of denture

( ) 1- Not have

( ) 2- Acrylic resin complete denture ( ) 3- Metal complete denture

( ) 4- Acrylic resin partial denture ( ) 5- Metal partial denture

( ) 6- Other .....

2) Retention sources (Can be more than 1 answer)

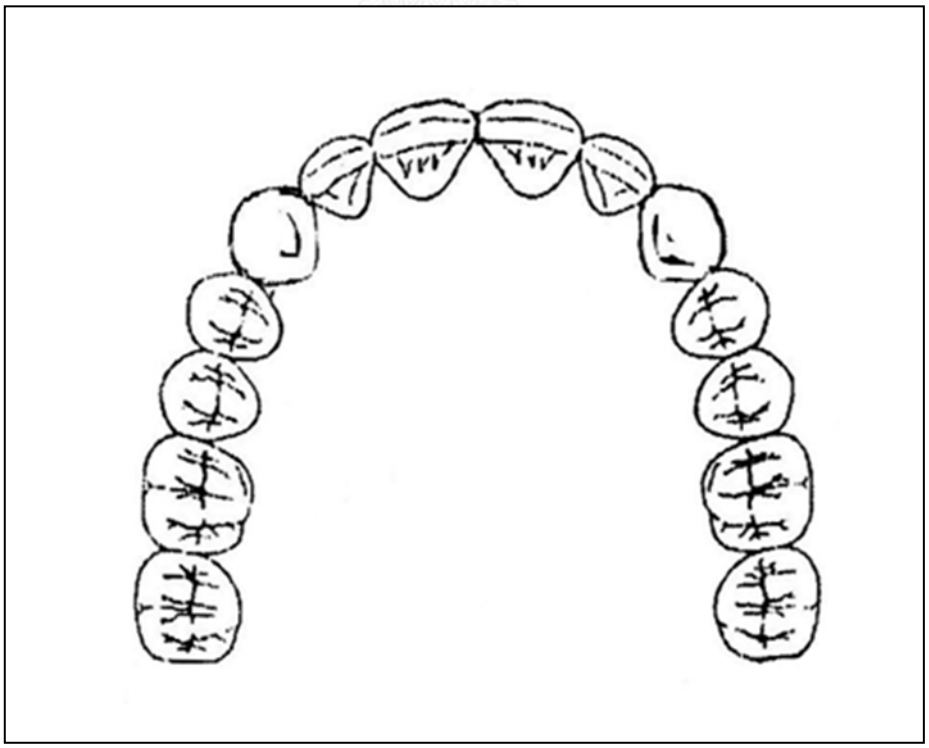
( ) 1- Clasp ( ) 2- Tied wire ( ) 3- Self-cured acrylic resin ( ) 4- Suction disc

( ) 5- Adhesion of denture and gingiva ( ) 6- Border seal

( ) 7- Other.....

Design

Kennnedy Class ( )1-I ( )2-II ( )3-III ( )4-IV ( )5-Edentulous



Quality of denture (Mark with / for the real quality)

Topic	Acceptable	Unacceptable	No assessment
1. Open mouth 20 mm, denture still in place			
2. Denture still in place when pulling anterior teeth in vertical direction			
3. Denture still in place when pulling anterior teeth in horizontal direction			
4. Denture still in place when pulling posterior teeth in vertical and horizontal direction			
5. Denture in place not floating in the mouth			
6. Posterior border ended before fovea palatinine and hamular notch			
7. Not higher than height of contour of anterior natural teeth			
8. Not higher than height of contour of posterior natural teeth			
9. Not terminate at the proximal of teeth			
10. No sharp edge			
11. No rocking action when force is applied on the occlusal table of each side			
12. Natural gingival appearance			
13. Proper length of incisal edge of anterior artificial teeth			
14. Color of artificial teeth harmonized with adjacent teeth			
15. No severe attrition of artificial teeth			
16.No porous, rough surface, opaque surface			
17. Artificial teeth should not be self-cured acrylic resin			
18. Patient can take off and wear denture by him/herself			

Lower arch

1) Type of denture

( ) 1- Not have

( ) 2- Acrylic resin complete denture ( ) 3- Metal complete denture

( ) 4- Acrylic resin partial denture ( ) 5- Metal partial denture

( ) 6- Other .....

2) Retention sources (Can be more than 1 answer)

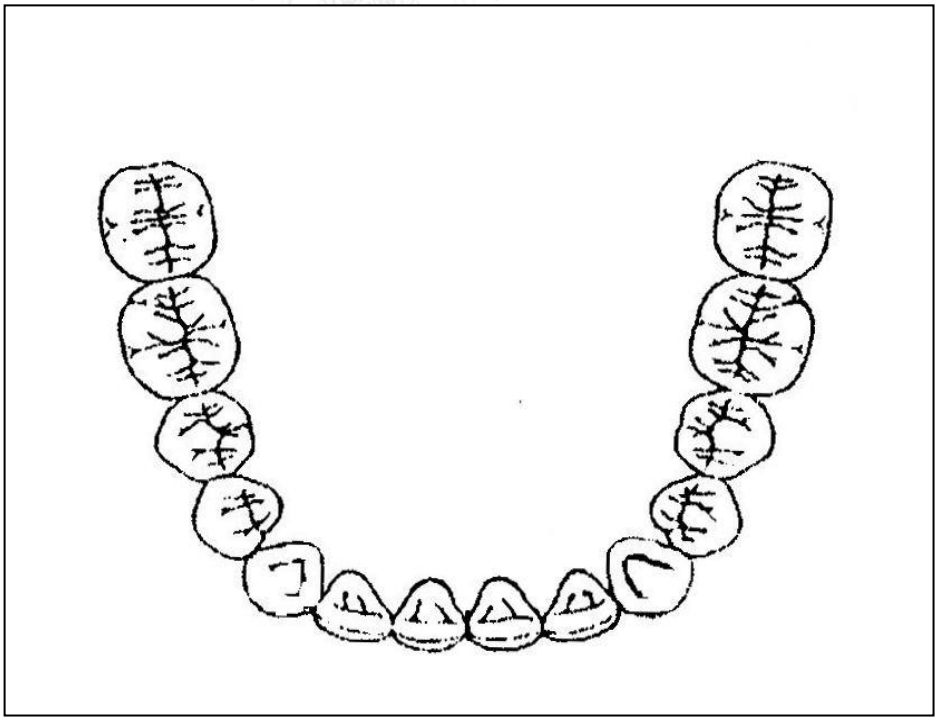
( ) 1- Clasp ( ) 2- Tied wire ( ) 3- Self-cured acrylic resin

( ) 4 Adhesion of denture and gingiva ( ) ๕- Border seal

( ) 6- Other.....

Design

Kennnedy Class ( )1-I ( )2-II ( )3-III ( )4-IV ( )5-Edentulous



Quality of denture (Mark with / for the real quality)

Topic	Acceptable	Unacceptable	No assessment
1. Denture still in place when lifting the tongue			
2. Denture still in place when pulling anterior teeth in vertical direction			
3. Denture still in place when pulling anterior teeth in horizontal direction			
4. Denture still in place when pulling posterior teeth in vertical and horizontal direction			
5. Artificial teeth should not be self-cured acrylic resin			
6. Posterior border ended at retromolar pad			
7. Not higher than height of contour of anterior natural teeth			
8. Not higher than height of contour of posterior natural teeth			
9. Not terminate at the proximal of teeth			
10. No sharp edge			
11. No rocking action when force is applied on the occlusal table of each side			
12. Natural gingival appearance			
13. Patient can take off and wear denture by him/herself			
14. Color of artificial teeth harmonized with adjacent teeth			
15. No severe attrition of artificial teeth			
16.No porous, rough surface, opaque surface			

Functioning

Topic	Acceptable	Unacceptable	No assessment
1. Denture still in place when chewing			
2. No sliding on functioning			
3. Denture fully occluded in the maximum intercuspation			
4. Denture still in place when grinding			

Part 6 Oral health

❖ 1. Denture stomatitis (mark with ◯ around type of Newton or not have)

( ) Newton type 1 2 3 ( ) 4- Not found

❖ 2. Epulis fissulatum

( ) Found ( ) 2- Not hound

❖ 3. Position related to denture

18	17	16	15	14	13	12	11	21	22	23	24	25	26	27	28	
																Crown
																Root

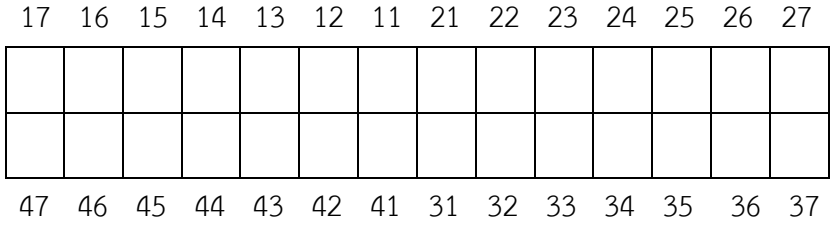
48	47	46	45	44	43	42	41	31	32	33	34	35	36	37	38	
																Crown
																Root

❖ 4. Status

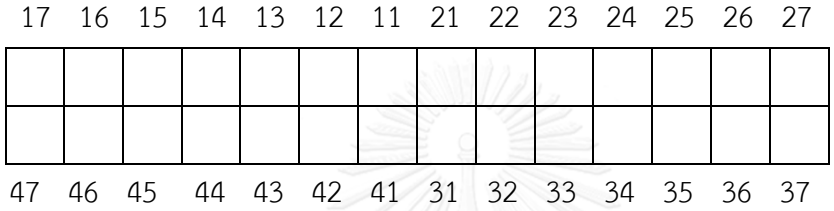
18	17	16	15	14	13	12	11	21	22	23	24	25	26	27	28	
																Crown
																Root

48	47	46	45	44	43	42	41	31	32	33	34	35	36	37	38	
																Crown
																Root

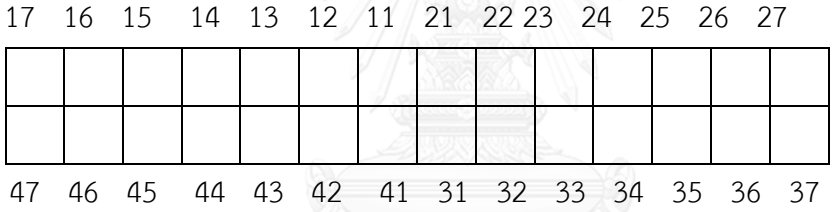
❖ 5. Professional need



❖ 6. Percieved need



❖ 7. Replaced spacing



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