

**A study utilizing anderson's model: exploring factors associated with dental attendance among older patients
at a university dental hospital in Thailand**

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Abstract

This study aims to explore the underlying reasons for the varying frequency of dental visits among the older population. Additionally, there is a scarcity of research on factors linked to dental attendance, based on Anderson's model of health service utilization. This retrospective study was conducted to analyze secondary data collected from a previous telephone-based survey and the dental records of a university dental hospital. The data covered the period from January 2019 to December 2020 and included information from male and female participants who sought dental care at the hospital during 2020, based on the earlier study. The study investigated various factors following Anderson's model of health service utilization. Predisposing factors such as age and sex. Enabling factors, including income, and oral health-related behaviors such as frequency of

toothbrushing. Additionally, the study evaluated the need factor through self-rated oral health. To analyze the data, descriptive statistics and Pearson's chi-squared test were utilized, with a significance level set at $p < 0.05$ to identify statistically significant associations. The study encompassed a sample of 402 older patients, aged 61 to 94 years. The majority of participants (55.2%) were aged 68 years or older, with an average age of 69.18 years. The results revealed a noteworthy positive association between age and sex as predisposing factors and the regular attendance of dental services among the older patients. The study findings indicate that older female participants were more likely to utilize dental services compared to their younger counterparts. Healthcare providers and policymakers should take note and work towards enhancing the accessibility of dental services for the older adults. By doing so, they can effectively improve oral health outcomes and consequently reduce the incidence of progressive oral diseases in this population.

Keywords: dental attendance, dental utilization, Anderson's Model, the older population, older adults

Introduction

By the year 2050, the global older population is projected to reach a staggering 1.5 billion. All regions across the world are expected to experience a significant increase in the number of individuals aged 65 and older between 2019 and 2050. Eastern and South-Eastern Asia, in particular, are anticipated to witness the highest surge, with the older population rising from 261 million in 2019 to a staggering 573 million by 2050. Similarly, in Thailand, the total population currently stands at 66.5 million people, and the number of older individuals has already reached 12 million by the year 2022. This accounts for nearly one-fifth of the entire Thai population.¹

Undoubtedly, the health burden faced by older adults poses a significant challenge to public health.

Notably, non-communicable diseases (NCDs) have emerged as a leading cause of disability and mortality in the older adults.² Chronic diseases and oral disorders often share common risk factors. Periodontal diseases, such as gingivitis and periodontitis, are frequently associated with NCDs. Periodontitis has been linked to an increased risk of various NCDs, including diabetes mellitus, endocarditis, cardiovascular disease, and chronic kidney disease.³ Furthermore, the older population globally has been found to suffer from poor oral health, with high rates of tooth loss, dental caries, and prevalence of periodontal disease, xerostomia, and oral precancer/cancer.⁴ Therefore, ensuring the utilization of healthcare services becomes crucial in preventing and treating health problems in this age group.

Healthcare utilization refers to the use of various services by individuals for purposes such as health prevention, treatment, promotion, and seeking information about their health condition and prognosis.⁵ Anderson's model is a framework that explains the factors influencing the use of health services, which include predisposing, enabling, and need factors.^{6,7} This model has been widely employed as a theoretical foundation in studies exploring the factors associated with dental utilization.⁸⁻¹²

The majority of individuals tend to seek dental care when they encounter problems rather than for preventive purposes.¹³ However, neglecting dental visits can lead to challenging oral issues, whereas regular preventive check-ups and proper home oral care effectively prevent oral diseases and enable early detection and treatment of oral disorders.¹³ Furthermore, regular dental care plays a crucial role in preserving existing teeth. A study has demonstrated that regular participants have a positive impact on oral health and a lower risk of experiencing severe oral health problems, reduced incidence of issues, and fewer psychological consequences.¹⁴ Another study revealed that individuals who had visited the dentist within the previous year believed that oral health significantly influenced their overall quality of life.¹⁵ Thus, it is essential to comprehend

and further specify the significance and determinants of dental care visits among older adults to effectively manage and plan the healthcare system.

Numerous studies have explored the factors that either facilitate or hinder older adults from attending dental appointments. Some previous research has shown significant associations between dental service utilization and certain general characteristics and oral health behaviors.¹⁰ However, there is a lack of research that specifically examines the connection between dental visits and key variables within Anderson's model of health service utilization. Moreover, in various countries, many studies heavily rely on self-reporting questionnaires, which might lead to an overestimation of dental care utilization when compared to more objective data sources like insurance claims or dental records. This potential recall bias is likely to be more prevalent among older adults compared to younger age group.¹⁶

This study was designed to mitigate recall bias by utilizing secondary data to investigate the utilization of dental services among older patients at a university dental hospital in Bangkok, Thailand. The findings expected to offer insights into the reasons behind the varying frequency of dental visits among older adults. Specifically, the study aimed to understand why certain older patients rarely attend dental clinics while others excessively use dental services.

The objective of this study was to investigate the factors linked to dental service utilization, employing Anderson's model of health service utilization as a theoretical framework. Secondary data from the dental records of the dental hospital were utilized to examine the hypothesis that there exists a potential variable associated with dental service attendance among older patients.

Methods

Research design and setting

The research design employed in this study is a quantitative retrospective approach that utilizes secondary data sources. The independent variables were gathered through a telephone-based survey conducted by Sermsuti-Anuwat et al. in 2022.¹⁷ On the other hand, the dependent variables were extracted from the dental resource system of the dental hospital of Chulalongkorn University during the period from January 2019 to December 2020. The study was conducted, and the manuscript was prepared following the guidelines outlined in the 'Strengthening the Reporting of Observational Studies in Epidemiology' (STROBE) statement.¹⁸ This guideline aimed to contribute to the improvement of reporting quality in observational studies. It also provided suggestions on what should be included in an accurate and complete report of an observational study.¹⁸

Eligibility criteria of study participants and sampling technique

In this study, purposive sampling was employed. The inclusion criteria comprised all male and female participants who aged 60 or above and sought dental care at the dental hospital of Chulalongkorn University in 2020, based on the initial study.¹⁷ Consequently, a total of 402 older patients who had previously completed the telephone-based study¹⁷ were included in the current investigation. However, individuals with severe systemic diseases and those who were unwilling to participate were excluded from the sample. From the initial telephone-based study, it was found that 434 patients (51.9%) declined to participate in the research out of the total number of interviewed individuals which was 836. It also means that the response rate was 48.1%.¹⁷

Research variables

Independent variables

The independent variables in this study were obtained from validated questionnaires used in the initial telephone-based study.¹⁷ Before conducting the data analysis, all the independent factors collected through

self-report questionnaires were categorized into three groups according to Anderson's model of health service utilization: (1) Predisposing factors include age and sex. (2) Enabling factors encompass income, and oral health-related behaviors, such as the frequency of toothbrushing. (3) Need factor is represented by self-rated oral health.

Dependent variable

The dependent variable was the dental attendance over the two-year period categorized into two groups including regular dental attenders and non-regular dental attenders. It was secondary data from dental record system in 2019-2020. Participants who completed survey of previous research¹⁷ and whose data were presented within the dental record system were classified as having attended dental services or grouped as "Yes" (indicating they had attended at least one dental visit). On the other hand, it was assumed that those participants whose data were absent from the dental record system had "not attend dental services" or grouped as "No" (indicating the lack of a dental visit).

Measurement tools and reducing bias

The data collection instrument utilized in the initial telephone-based study¹⁷ was developed based on the 8th Thai national oral health survey.¹⁹ The validity of the questionnaire was evaluated with a satisfactory Item-Objective Congruence Index of 0.77 and internal consistency reliability, assessed using Cronbach's alpha coefficient, was 0.70.¹⁷ To validate the telephone interview process, the research adviser trained the interviewer to conduct the telephone survey with the 3-hour training program. The content of the training program consisted of basic interview techniques: read the questions as written with a suitable and gentle voice tone and an appropriate explanation. Moreover, interviewer was not allowed to call acquaintances to reduce bias. To minimize recall bias, the dependent variable, which involved dental attendance data from January 2019 to

December 2020, was obtained from secondary data extracted from the dental system resource of the university dental hospital.

Sample size calculation

The sample size was determined based on a specified absolute precision²⁰

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

When the $Z_{1-\alpha/2}$ value was 1.96 (Z-value related to the confidence interval and the tail), the proportion (P) was 0.381 (According to the 8th national survey, 38.1% of the older adults in Bangkok used dental services in 2017¹⁹), the level of precision (d) was 0.05. Finally, the total minimum number of samples for this study was 363 subjects.

Statistical analysis

Descriptive analysis was used to analyze the distribution of frequency and percentage of 1) predisposing factors including age and sex 2) enabling factors such as income and frequency of toothbrushing 3) need factors which included self-rated oral health and 4) the information of dental service utilization during 2019-2020.

For age, which was continuous variable, Kolmogorov-Smirnov test was used for finding normality test. It was found that this data was non-normal distribution ($p < 0.001$). Therefore, median of age (68 years) was the cut-off point for reclassified into age groups. In summary, there were two age groups including older participants aged less than 68 years and older participants aged equal or more than 68 years.

For the inferential analysis, Pearson's Chi-squared test was employed to assess the associations between each categorical independent variable and the dependent variable (dental attendance during 2019-2020). A p-value of less than 0.05 was considered statistically significant.

Ethical consideration

The research received approval from the Ethics Review Committee of the DCU (HREC-DCU 2021-039) in accordance with the Declaration of Helsinki and ICH Good Clinical Practice Guidelines. Informed consent was not required as the data collection involved secondary data, and any patient identifiers, if collected, were removed to ensure confidentiality.

Results

General characteristics of the study participants

Table 1 displays the enrollment data for 402 study participants. The average age was 69.18 years, and the median age was 68 years. Of these participants, 180 (44.8%) were categorized as older adults aged less than 68 years, while 222 (55.2%) were classified as older adults aged 68 years or older. The majority of participants were female (61.4%). A considerable portion of the subjects had an income equal to or greater than 15,000 Baht [440.14 USD] (57.2%). Regarding oral health-related behaviors, a significant number of older participants brushed their teeth at least twice a day (94.2%). Concerning need factors, most participants rated their oral health as fair (55.4%). In terms of the information of dental attendance, the majority of subjects (91.3%) attended dental services utilization during 2019-2020 (367 older participants), while 35 participants (8.7%) did not exhibit dental attendance.

Table 1: General characteristics of the study participants (N = 402)

Variables	Number	Percent
Predisposing factors		
Age: years		
< 68	180	44.8
≥ 68	222	55.2
Sex:		

Female	247	61.4
Male	155	38.6
Enabling factors		
Income:		
≥ 15,000 THB	230	57.2
< 15,000 THB	172	42.8
Toothbrushing frequency (N = 398):		
≥ twice daily	375	94.2
< twice daily	23	5.8
Need factors		
Self-perceived oral health (N=401):		
Good / Fair	350	87.3
Poor	51	12.7
Attended dental services utilization during 2019-2020		
No	35	8.7
Yes	367	91.3

Factors associated with utilization of dental services.

In Table 2, the factors associated with the utilization of dental services were assessed using Pearson's chi-squared test, with a significance level of p-value < 0.05 considered statistically significant. Among all the factors analyzed, age ($p < 0.001$) and sex ($p = 0.046$) were found to have significant associations with dental attendance. However, there were no significant associations observed between dental utilization and income, frequency of toothbrushing, and self-rated oral health.

Table 2: Factors associated with dental attendance among the participants

Variables	Attended dental services utilization during 2019-2020, N (%)		p-value ^a
	No	Yes	
Predisposing factors			
Age: years			<0.001
< 68	27 (15.0)	153 (85.0)	
≥ 68	8 (3.6)	214 (96.4)	
Sex:			0.046
Female	27 (10.9)	220 (89.1)	
Male	8 (5.2)	147 (94.8)	
Enabling factors			
Income:			0.993
≥ 15,000 THB	20 (8.7)	210 (91.3)	
< 15,000 THB	15 (8.7)	157 (91.3)	
Toothbrushing frequency (N = 398):			0.438
≥ twice daily	34 (9.1)	341 (90.9)	
< twice daily	1 (4.3)	22 (95.7)	
Need factors			
Self-perceived oral health (N=401):			0.060
Good / Fair	27 (7.7)	323 (92.3)	
Poor	8 (15.7)	43 (84.3)	

Note: ^a p-value from Pearson's chi-squared test

Discussion

Anderson behavioral model are useful theories for analyzing the factors related to healthcare use.^{6, 7}

This study used this theory to examine the factors related to dental care use. The findings of this study revealed that age and sex, both considered predisposing factors, exhibited a significant positive association with regular dental attendance among older patients.

For predisposing factors (age), these results are in line with previous studies that also support the association between dental attendance and increasing age. For instance, a cross-sectional study conducted in the United States among older individuals aged 60 or older demonstrated that advancing age was linked to recent dental visits within the past year.²¹ Similarly, a study conducted in Germany reported that older age was associated with a higher likelihood of utilizing regular dental check-ups, particularly among the migrant group.²² Furthermore, previous studies in Brazil have indicated that older adults were significantly more likely to have seen a dentist within the past 12 months compared to adolescents aged 18 to 21 years.²³

Furthermore, this finding aligns with a previous study conducted in Thailand by Limpuangthip et al, which also demonstrated a significant relationship between public denture utilization in the country over the past five years and predisposing factors, such as older age.¹⁰ The study indicated that older individuals were more likely to attend dental services compared to the younger age group. This trend was attributed to the fact that individuals who were younger would eventually transition into the older people, indicating that older individuals tend to have more oral health problems than the younger age group.¹⁰ Therefore, the older adults, especially those who are older, may encounter increased dental care needs, particularly concerning chewing function.

Another explanation provided was that problems arising from missing teeth could lead individuals to seek dental substitution treatments. Thailand's national oral health survey in 2017 showed that older adults aged 60-74 years had remaining natural teeth of 20 or over (56.1%), whereas older adults aged 80-85 years had remaining natural teeth of 20 or above (22.4%).¹⁹ Consequently, older people had a higher chance of experiencing problems related to tooth loss compared to early older adults.¹⁹ Additionally, a study by Brothwell et al. also confirmed that edentate older individuals with oral problems were more likely to attend dental services.¹¹

In summary, this study found that increasing age was significantly associated with dental services because older adults had more oral problems than younger adults. Therefore, older adults were necessary to receive more dental treatment than younger adults, and it could be implied that using dental services among the older people was driven by oral problem-oriented than prevention-oriented. Study by Devaraj et al. also confirmed that the majority of individuals typically seek dental care in response to issues rather than for preventive purposes.¹³

Regarding the sex variable, which was predisposing factor, consistent with previous research, our study also found that the sex variable played a significant role in dental utilization.^{8-10, 12} Specifically, it was observed that public denture utilization in Thailand over the last five years was significantly associated with sex as a predisposing factor. Older female individuals were more likely to seek dental services compared to their male counterparts.¹⁰ Other studies also emphasized the strong connection between sex as a predisposing factor and dental service usage. Older women tended to have higher dental utilization rates than older men.^{8, 9} Moreover, a systematic review highlighted disparities in dental utilization, with men demonstrating considerably lower consumption compared to women.¹² These consistent findings shed light on the importance of considering sex as a significant determinant in understanding dental service utilization patterns.

Regarding enabling and need factors based on Anderson model, the findings of this study revealed no significant association with dental attendance. A systematic review indicated that dental service utilization was not consistently associated with need-based characteristics such as oral health status, missing teeth, overall health, tooth pain, or dental decay.¹² This may be attributed to dental phobia or anxiety, which can affect dental care service use regardless of patient's need factors.¹² Consequently, dental care appeared to be more of an optional healthcare service rather than a necessity. Moreover, need factors such as self-rated oral health were

not strong predictors for dental utilization, as oral problems were typically not life-threatening.¹² The researchers suggested that the decision to seek dental care might be influenced by various factors beyond the severity of one's oral health condition. In essence, individuals' choices regarding dental care seemed to be influenced by a combination of factors that extended beyond the immediate urgency of their oral health needs.

Strengths and limitations of the study

This study obtained data on dental attendance directly from the university dental hospital's actual record system. As a result, dental records provided a more precise and reliable source of information compared to relying on questionnaires, which could potentially lead to an overestimation of actual dental care consumption. Some studies have indicated that self-reporting methods may show higher dental care utilization compared to more objective sources like insurance claim registration or dental records, potentially resulting in an overestimation of real dental visit consumption.¹⁶ Thus, secondary data from dental record system can reduce the recall bias. Moreover, the use of telephone interviews was employed because of a convenient and cost-effective method to collect diverse data from participants across a wide geographic area.²⁴

Nevertheless, studying does have some limitations. The initial survey was conducted via telephone due to the Covid-19 pandemic.¹⁷ This limitation resulted in the exclusion of specific clinical characteristics as independent variables in the study. In future research, consideration might be given to exploring variables such as the number of teeth or other clinical characteristics. Additionally, the data on dental attendance were solely derived from the university dental hospital's database, which may not represent the entirety of dental care usage within the community. Information from the private sector or other public health systems was not taken into account, potentially limiting the study's generalizability and comprehensive understanding of dental service utilization across different healthcare settings.

Generalizability and recommendation

Caution should be exercised when interpreting the findings of this study, as they may primarily apply to the older population residing in urban areas. Future research should aim to investigate dental service utilization in a more diverse range of public and private settings to gain a broader and more comprehensive understanding of the topic. Moreover, some studies suggest that a decrease in dental utilization during the emergence of infectious diseases, like COVID-19.²⁵ It is essential to investigate the factors affecting dental care utilization and take measures to prevent any associated negative impacts.

Conclusions

This study found two important predisposing factors including age and sex which associated with dental utilization. To enhance oral health outcomes among the older patients, healthcare providers and policymakers should prioritize efforts to improve dental service accessibility, with special attention given to the early old age group and females. By focusing on these demographics, it becomes possible to prevent the progression of oral diseases and promote better oral health in this population.

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