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# The Quality of Denture Influencing Oral-Health-Related Quality of Life in Complete Denture Wearing Older Adults: A Systematic Review

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## Abstract

**Background:** One major oral problem for Thai elderly patients is tooth loss, adversely affecting the quality of grinding and occlusion. Thus, wearing a complete denture to replace missing teeth is essential so that the patient can better use the denture to grind, talk, and improve their quality of life.

**Objectives:** To investigate empirical evidence about denture quality factors affecting the oral-health-related quality of life (OHRQoL) of elderly with a conventional complete denture.

**Methods:** This systematic review was conducted to search for related studies published between 2010 and 2020 from international databases, including PubMed, SCOPUS, Cochrane Library, Web of Science, and ScienceDirect. Two researchers independently conducted research by selecting research on denture quality factors affecting OHRQoL, critical appraisal of research, data extraction, and the narrative synthesis process.

**Results:** Of all 699 studies obtained from the search, five studies were selected to include in this research. There were two retrospective cohort studies and three cross-sectional studies. The majority of studies were of short duration. Only one study provided 7-year evaluations.

**Conclusions:** The denture quality factors affecting OHRQoL included maxillary and mandibular stability and retention, articulation, and esthetic.

**Keywords:** conventional complete denture, oral-health-related quality of life, quality of denture, systematic review

## Introduction

Oral health is a window to overall health. Teeth are the main organs in the oral cavity. Tooth loss is, therefore, a major problem, especially in old age. It is one of the major oral problems in Thai older adults.<sup>(1)</sup> The elderly who have less than 20 teeth left in their oral cavity are at a higher risk of developing dementia.<sup>(2,3)</sup> A tooth loss affects eating<sup>(4)</sup> and the effectiveness of chewing food.<sup>(5)</sup> It increases the risk of malnutrition associated with increased mortality in the elderly.<sup>(6)</sup> Tooth loss thus worsens the oral-health-related quality of life (OHRQoL) of patients.<sup>(7)</sup> It has been reported that 8.7% of Thai elderly aged 60-74 years and 31.0% of those aged 80-85 years have lost all their teeth. According to all teeth loss, patients require to wear a complete denture to restore oral function and reduce the risk of complications from teeth loss. Studies in Thailand have shown that after replacing a complete denture, most elderly can chew and eat more food<sup>(8)</sup>, can smile more, are more comfortable, and are happier.<sup>(8,9)</sup> Moreover, denture replacement leads to an increase in body mass index (BMI), especially for older people with low BMI.<sup>(10)</sup> According to the systematic review in 2019, after the elderly patients received complete dentures, their OHRQoL increased.<sup>(11)</sup> Thus, enhancing the quality of life requires promoting factors affecting the OHRQoL.

OHRQoL is part of the quality of life affected by the oral health of that person. It is an indicator that measures the impact of disease or oral disorders on daily life and the social role of a person. OHRQoL demonstrates the size of the problem or its effects. It has been used to study the impact of dentures on quality of life.<sup>(12-18)</sup>

Although there have been studies on denture quality factors affecting OHRQoL of complete denture wearers,

there has been no systematic review that could indicate the denture quality factors influencing OHRQoL comprehensively. This research, therefore, investigates the denture quality factors influencing the OHRQoL of complete denture wearers using a systematic review method. This research will be useful for improving the OHRQoL as well as the health system of the elderly with a completed denture.

## Materials and Methods

### Research methodology & selection

The PICO (population, intervention, comparison, outcome) question addressed was “What is the denture quality that influences OHRQoL for complete denture wearers?” The review was designated according to inclusion and exclusion criteria shown in Table 1.

An electronic search in PubMed, Scopus, Cochrane Library, Web of Science, and ScienceDirect databases was conducted by two independent examiners (T.M. and R.S.). A third researcher (P.C.) will decide in case of disagreement between two independent examiners.

Only articles published in journals indexed in databases were selected. Table 2 shows the search strategies used for each database. Selected references were exported to EndNote and duplicates were removed. The titles and abstracts of articles obtained from initial records from electronic database searches were evaluated by two investigators. The electronic search resulted in a database of 699 publications; 129 duplicates were identified and removed, leaving 570 references for further evaluation. After a manual title search, 67 full article records were considered. After examination of abstracts and texts, five full-text articles were selected.

**Table 1:** Inclusion and exclusion criteria

PICOs	Inclusion criteria	Exclusion criteria
Population	<ul style="list-style-type: none"> <li>Participant's age &gt; 60 years</li> </ul>	<ul style="list-style-type: none"> <li>Implant retained and tissue supported overdenture</li> <li>Using the same participants in another publication</li> </ul>
Interest phenomenon	<ul style="list-style-type: none"> <li>Reporting on quality of complete denture</li> </ul>	
Comparison	<ul style="list-style-type: none"> <li>Indefinite</li> </ul>	
Outcome	<ul style="list-style-type: none"> <li>Reporting on quality of life of complete denture wearer</li> </ul>	
Study	<ul style="list-style-type: none"> <li>Observational study (cross-sectional, cohort study, case-control study), randomized controlled trial, qualitative research</li> <li>Published between 2010 and 2020</li> <li>English or Thai.</li> </ul>	<ul style="list-style-type: none"> <li>Review article, systematic review, and meta-analysis</li> <li>Full-text paper unreachable</li> </ul>

**Table 2:** Electronic search strategies

Database	Search strategy
PubMed	((elderly* OR Elder* OR Frail* OR older adult* OR older person* OR ageing* OR aging* OR senior* OR geriatric) AND ((Complete denture[MeSH Terms]) OR (Complete denture* OR "Conventional completed denture" OR Complete prosthetic* OR "removable complete denture"[MeSH Terms])) AND (denture quality* OR chewing ability OR quality of conventional complete dentures OR quality of complete denture* OR quality of dentures OR Denture retention OR Denture stability OR Denture support OR Esthetic* OR Aesthetic* OR Masticatory efficiency*) AND ("Life Quality" OR "Quality of Life" OR "Health-Related Quality Of Life" OR "HRQOL" OR "Oral health-related Quality Of Life" OR "OHRQoL" OR well being* OR happiness*))
Scopus	(elderly* OR elder* OR frail* OR older AND adult* OR older AND person* OR ageing* OR aging* OR senior* OR geriatric* ) AND ( {Complete denture} OR complete AND denture* OR "Conventional completed denture" OR complete AND prosthetic* OR "removable complete denture" ) AND ( denture AND quality* OR chewing AND ability OR "quality of conventional complete denture" OR "quality of complete denture" OR quality AND of AND dentures OR denture AND retention OR denture AND stability OR denture AND support OR esthetic* OR aesthetic* OR masticatory AND efficiency*) AND ("Life Quality" OR {Quality of Life} OR "Health-Related Quality Of Life" OR {HRQOL} OR "Oral health-related Quality Of Life" OR {OHRQoL} OR well AND being* OR happiness* )
Cochrane Library	(elderly* OR Elder* OR Frail* OR older adult* OR older person* OR ageing* OR aging* OR senior* OR geriatric) AND ((Complete denture) OR (Complete denture* OR "Conventional completed denture" OR Complete prosthetic* OR "removable complete denture")) AND (denture quality* OR chewing ability OR quality of conventional complete dentures OR quality of complete denture* OR quality of dentures OR Denture retention OR Denture stability OR Denture support OR Esthetic* OR Aesthetic* OR Masticatory efficiency*) AND ("Life Quality" OR "Quality of Life" OR "Health-Related Quality Of Life" OR "HRQOL" OR "Oral health-related Quality Of Life" OR "OHRQoL" OR well being* OR happiness*)
Web of Scienc	(TS=(elderly* OR Elder* OR Frail* OR older adult* OR older person* OR aging* OR senoir* OR geriatric)) AND (TS=(Complete denture OR complete denture* OR "Conventional complete denture" OR complete prosthetic* OR "removable complete denture")) AND (TS=(denture quality* OR chewing ability OR quality of conventional complete denture OR quality of complete denture* OR quality of dentures OR Denture
Science Direct	(elderly OR older) AND ("Complete denture") AND (denture quality OR chewing ability OR Denture retention OR stability OR support Esthetic) AND ("Quality of Life")

**Research quality assessment and data extraction**

The remaining articles were assessed by two researchers (T.M. and R.S.) using the Joanna Briggs Institute Critical Appraisal Checklist.<sup>(19)</sup> The appraisal aims to assess the methodological quality of a study and determine the extent to which a study has addressed the possibility of bias in its design, conduct, and analysis. The quality assessment results are presented in Table 3.

Data from papers included in the review were extracted using Joanna Briggs Institute Data Extraction Form for Experiment/ Observational Studies by the two researchers (T.M. and R.S.). The extracted data including specific details about the interventions, populations, study methods, and significant outcomes were used for the review questions and objectives. Due to the heterogeneity of the denture quality measurement methods and the differences in OHRQoL assessments, no quantitative analysis was performed.

Inter- and intra-examiner calibrations were performed on 15 example articles in which assessments from two researchers (T.M. and R.S.) to be calibrated were compared to those from a gold standard examiner (P.C.). After calibration, the Kappa statistics were 0.80-1.00 (Table 4).

**Narrative synthesis**

Narrative synthesis is a process that uses texts and illustrations to describe, compare, and combine heterogeneous results. The synthesis was conducted using an element of Popay *et al.*<sup>(20)</sup> A narrative synthesis comprised four key elements. Within each element, various tools were employed to suit the nature of the evidence.

The element 1 (Developing a theory of how the intervention works, why and for whom) of the narrative synthesis method was not applied as this study sought to aggregate literature on the quality of denture and OHRQoL.

Therefore, no theory was developed before the review. For element 2 (Developing a preliminary), texture descriptions, tabulation, grouping and clustering were used to develop an initial description of the included studies and to identify patterns across studies. Table 5 provides details of the study design, objectives, and outcomes. For element 3 (Exploring relationships in the data), a conceptual model was used to provide a visual representation of the state of knowledge about the denture quality factors influencing OHRQoL in complete denture wearers. For element 4 (Assessing the robustness of the synthesis product), Gough's weight of evidence framework<sup>(21)</sup> was used to assess the study's methodological soundness, the appropriateness of the study design to answer the review question, the relevant study, and an assessment of the overall weight of evidence that the study provides (Table 3). Gough's weight of evidence framework is a widely used tool. It is suitable for qualitative and quantitative studies. This process involves 3 rating scores: high, medium or low.

## Results

### Search

The initial search between October 2020 and January 2021 yielded 699 studies. After the duplicate research was eliminated, 570 studies were obtained. A total of 65 articles were read thoroughly. Figure 1 details the results of the search strategy. In the end, five articles met the inclusion criteria of the review.<sup>(12-16)</sup>

### Study characteristics

The characteristics of the included studies are summarized according to study design, the number of subjects, duration, location, aims, and outcomes of the studies (Table 5). The number of participants in the study ranged from 32 to 400. Among five studies, there were two cohort studies<sup>(14,15)</sup> and three cross-sectional studies.<sup>(12,13,16)</sup> The majority of studies were conducted in a short duration. Only one study took 7-year evaluations.<sup>(15)</sup>

Data collection was undertaken in two settings: hospitals<sup>(13)</sup> and dental schools.<sup>(12,14-16)</sup> All studies were established in Asia. Various questionnaires were used to collect OHRQoL data, Oral Health Impacts Profile-14<sup>(13)</sup>, Oral Health Impacts Profile-20<sup>(12)</sup>, Oral Health Impacts Profile for Edentulous<sup>(14,16)</sup>, and Oral Impacts on Daily Performances.<sup>(15)</sup> Quality of dentures was assessed using

varied denture assessment forms including functional assessment denture<sup>(13)</sup>, Kapur criteria<sup>(16)</sup>, modified Kapur criteria<sup>(15)</sup>, self-assessment of denture form<sup>(14)</sup> and developed clinical examination form.<sup>(12)</sup>

A total of 850 elderly denture wearers were evaluated. Participants used in the study of Chen *et al.*<sup>(13)</sup> were selected from the new welfare and public health program in Kaohsiung City. Komagamine *et al.*<sup>(14)</sup> and Yamaga *et al.*<sup>(16)</sup> recruited participants from the Tokyo Medical and Dental University Hospital, Faculty of Dentistry. Limpuangthip *et al.*<sup>(15)</sup> recruited participants with complete edentulism, with maxillary and mandibular complete dentures treated at Chulalongkorn University Dental School. One study did not explain how participants were recruited.<sup>(12)</sup>

The main results of five studies are shown in Table 5. The strength of evidence is shown in Table 3. Using Gough's weight of evidence framework<sup>(21)</sup>, two studies were weighted as "high". Three studies were weighted as "medium", due to their absence of identifying confounding factors and strategies to deal with such factors.

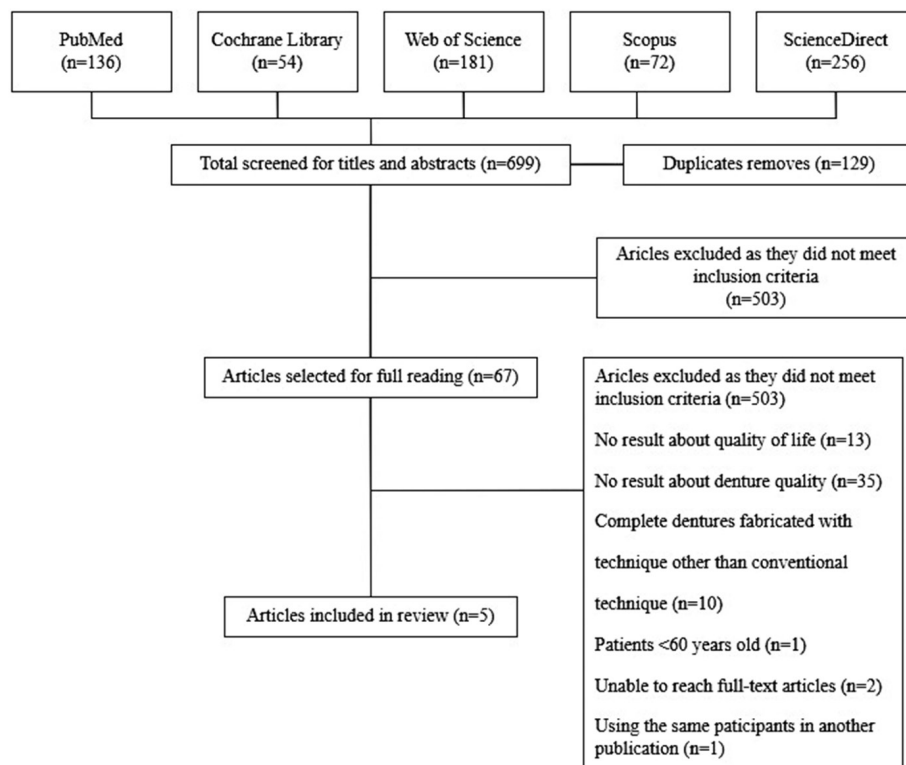
### Outcomes of interest

This systematic review observed that most studies assessed the quality of dentures by dentists. Only one study assessed dentures using self-assessment.<sup>(14)</sup>

### Evaluation of denture quality by a dentist

All included studies measured denture stability and retention which were primarily achieved using denture evaluation by a dentist.<sup>(12,13,15,16)</sup> They had a high portion of participants with acceptable denture stability for upper dentures (87.30%-84.4%).<sup>(12,13,15)</sup> However, the portion of participants with acceptable denture stability for lower dentures was various. Percentages of participants with acceptable denture stability of lower dentures were reported to be high in the studies of Alfadda *et al.* (78.1%)<sup>(12)</sup> and Chen *et al.* (80.25%)<sup>(13)</sup> but moderate in the studies of Limpuangthip *et al.* (50%)<sup>(15)</sup> and Yamaga *et al.* (60.24%).<sup>(16)</sup>

For the retention of upper dentures, high percentages of participants wearing dentures with acceptable retention were reported (95.23%-72.75%).<sup>(12,13,15)</sup> In the case of lower dentures, percentages of participants wearing dentures with acceptable retention varied greatly. In Alfadda's study, only 37.5% of patients had dentures with



**Figure 1:** Flow diagram of the search process.

acceptable retention.<sup>(12)</sup> In the study of Yamaga *et al.*<sup>(16)</sup>, the percentage of participants wearing dentures with good retention was 63.3%. Limpuangthip *et al.*<sup>(15)</sup> reported a high percentage of participants with acceptable denture retention (80.16%).

Denture quality measured by dentists was statistically associated with OHRQoL: maxillary retention<sup>(13,15)</sup>, maxillary stability<sup>(12,13,15)</sup>, mandibular retention<sup>(15)</sup>, mandibular stability.<sup>(12,15,16)</sup> In patients with unacceptable denture stability and retention, oral most impacted the physical domains including eating<sup>(13,15)</sup>, speaking<sup>(13,15)</sup>, cleaning a denture<sup>(15)</sup> and sore jaw<sup>(13)</sup>; followed by the psychological domains including maintaining usual emotion, smiling/laughing, and sleeping.<sup>(15)</sup>

The esthetic of dentures was assessed in two studies.<sup>(12,15)</sup> The dental evaluation was based on esthetic of lip support and lower lip line<sup>(12)</sup>, unparallelled interpupillary line and the incisal edge of the maxillary central incisor<sup>(15)</sup>, noncoincidence facial and dental midline, mismatched proportion of maxillary central incisor<sup>(15)</sup>, maxillary anterior teeth, and lateral incisor to canine.<sup>(15)</sup> All these studies had high percentages of patients with the acceptable esthetic of dentures (91.8%-80%). Two studies found that esthetic was not correlated with

OHRQoL.<sup>(12,15)</sup>

Denture occlusion was reported in the studies of Alfadda *et al.*<sup>(12)</sup> and Chen *et al.*<sup>(13)</sup> Both studies reported that the percentage of participants with good denture occlusion was high (93.8%-81%) and occlusion was not associated with OHRQoL.<sup>(12,13)</sup>

Articulation and freeway space were measured in only one study. Chen *et al.*<sup>(13)</sup> reported that percentages of participants with acceptable freeway and articulation were 74.25% and 71.25%, respectively. There was a significant association between articulation and OHRQoL, which affected: (i) physical disabilities including avoiding eating food and being interrupted during meals, (ii) psychological disabilities including concentration and embarrassment, (iii) social disabilities including irritability with others and difficulty performing jobs, (iv) handicaps including unsatisfied with life and unable to work (Chen *et al.*<sup>(22)</sup>) Freeway space was not correlated with OHRQoL.

**Evaluation of denture quality by patients**

A prospective study<sup>(14)</sup> was conducted using questionnaires related to upper dentures, lower dentures, esthetic and speech, and a 100 mm visual analog scale to assess the quality of dentures from the patient perspec-



tive. Questions related to esthetic and speech included "How often do your dentures click when chewing?", "How worried are you about other people watching?", "How worried are you about your mouth?" and "How easy was it for you to speak?". The esthetic and speech scores were reported to be high. Surprisingly, there was a significant correlation between the esthetic assessed by the patient and OHRQoL.

Thus, this systematic review indicated that maxillary stability<sup>(12,13,15)</sup>, maxillary retention<sup>(13,15)</sup>, mandibular stability<sup>(12,14-16)</sup>, mandibular retention<sup>(12,14,15)</sup>, articulation<sup>(13)</sup> and patient-assessed esthetic<sup>(14)</sup> were associated with OHRQoL. The factors examined in the included studies but found to have no significant relationship with OHRQoL were esthetic assessment by a dentist<sup>(12,15)</sup>, occlusion<sup>(12,13)</sup> and freeway space.<sup>(13)</sup>

### Discussion

This systematic review aimed to review the denture quality factors influencing the OHRQoL of complete denture wearers. The review process in this study is transparent and reproducible. It was clearly established. The keywords were established using the PICO principle. The studies were searched through accepted databases. Data extraction and appraisal were carried out during the selection process by two researchers (T.M. and R.S.)

who had been standardized by the expert (P.C). The data synthesis was conducted using Popay's narrative synthesis model, which clearly defines the process of content synthesis, is transparent, and can verify the findings.<sup>(20)</sup>

The results showed that the denture quality factors influencing the OHRQoL of complete denture wearers were the stability of upper and lower dentures, retention of upper and lower dentures, articulation, and esthetic.

The stability of upper and lower dentures related to OHRQoL can be explained by the stability and retention of dentures providing a conducive environment for an oral function that provides patients with a good quality of life. This was consistent with the studies of Inukai *et al.*<sup>(22)</sup> and Fueki *et al.*<sup>(23)</sup>, which reported that mastication was a critical factor in improving quality of life. de Souza e Silva *et al.*<sup>(24)</sup> stated that the stability of the complete denture improved the patient's ability to chew food, which positively affected OHRQoL. These studies were supported by Yamaga's structural model analysis,<sup>(16)</sup> which indicated that the stability of mandibular complete denture scores was correlated with OHRQoL through masticatory scores. On the other hand, a study by Anastassiadou and Robin<sup>(25)</sup> found a direct correlation between the use of unstable dentures and difficulty chewing. Moreover, patients reported an increased shifting of their upper dentures. It can be said that patients with stable removable

**Table 3:** Weight of studies by the strength of evidence

Study	Weight A: Trustworthiness	Weight B: Appropriateness	Weight C: Relevance	Weight D: Overall weight
Alfadda <i>et al.</i>	Medium	Medium	High	Medium
Chen <i>et al.</i>	High	Medium	High	High
Komagamine <i>et al.</i>	High	Medium	Medium	Medium
Limpuangthip <i>et al.</i>	High	High	High	High
Yamaga <i>et al.</i>	Medium	Medium	High	Medium

**Table 4:** Intra- and inter-examiner calibrations were performed on 15 example articles in which assessments from two researchers (T.M. and R.S.).

Example articles	Intra-examiner Mean kappa		Inter-examiner Mean kappa	
	TM	RS	TM	RS
3 case control studies	0.808	0.800	0.808	1.00
3 cohort studies	1.00	1.00	0.804	0.804
3 RCT studies	1.00	0.806	0.806	0.806
3 cross-sectional studies	1.00	1.00	1.00	1.00
3 example articles for JBI data extraction form calibration	0.900	1.00	0.800	0.898

**Table 5:** Studies included in the systematic review

Author	Study design	Number of subjects	Duration	Location of study	Aim (s)	Outcome
Alfadda <i>et al.</i>	Cross-sectional	N=32	1-time survey and 1 clinical examination	Saudi Arabia	To explore the relationship between the clinical quality of conventional complete denture and OHRQoL.	The mean total score of OHIP-20 was 56.3±15.9. The stability of the maxillary and mandibular dentures was the denture quality parameter that most significantly affected patient OHRQoL.
Chen <i>et al.</i>	Cross-sectional	N=400	1-time survey and 1 clinical examination	Taiwan	To explore the relationship between the essential functional qualities of complete denture and OHRQoL.	The mean OHIP-14 score was 11.73±10.12. When comparing the mean OHIP-14 score with each FAD criteria, it was found that occlusion (2i), articulation (2ii), maxillary denture retention/vertical pull (3i), upper stability (lateral displacement) (4i), and maxillary denture stability (pronounced rocking) (4ii) had a significant difference.
Komagamine <i>et al.</i>	Prospective cohort	N=122	3 months	Japan	<ul style="list-style-type: none"> <li>- To develop a questionnaire for denture self-assessment.</li> <li>- To describe factors related to patient self-assessment of dentures affecting OHRQoL before and after replacing complete denture.</li> </ul>	The OHIP-EDENT score before replacing complete denture (26.27±14.40) was significantly higher (worse OHRQoL) than after replacing scores (16.20±11.99). Stepwise multiple regression analysis showed that retention and stability of the lower denture and aesthetic/speech was the self-assessment denture quality parameter that most significantly affected OHRQoL in edentulous patients.
Limpuangthip <i>et al.</i>	Retrospective Cohort	N=130	7 years	Thailand	To investigate denture and patient-related factors associated with OHRQoL, general health, and happiness.	Unacceptable denture retention or stability was identified in 13.8% of maxillary dentures and 49.2% of mandibular dentures. Oral most impacted the physical domains (43.0%) (eating and speaking). The bivariate analysis indicated that unacceptable denture retention and/or stability significantly affected the physical and psychological domains of OHRQoL (eating and speaking).
Yamaga <i>et al.</i>	Cross-sectional	N=166	1-time survey and 1 clinical examination	Japan	To investigate the relationship among mandibular ridge form, stability and retention of the mandibular complete denture, the accuracy of jaw relation recording, patients' perception of chewing ability, satisfaction with dentures, and OHRQoL in complete denture wearers.	Clinicians mostly rated the clinical quality of the maxillary dentures in the category "some stability" (46.4%) and the mandibular denture in the category "no retention" (39.8%). A structural equation model was used to investigate mandibular ridge form, stability and retention of a mandibular denture, accuracy of jaw relation recording patients' perception of chewing ability, satisfaction, and OHRQoL in complete denture wearers. The model demonstrated that the mandibular denture stability score had a total medium effect on the OHIP-EDENT-J summary score, which comprised some indirect effects via jaw relation index, mastication score, and satisfaction. However, the mandibular denture retention score did not have any statistically significant effect on OHIP-EDENT-J summary score.

complete dentures can easily eat more and experience fewer oral-related problems, allowing them to have a better OHRQoL. In addition, the stability of the lower complete denture affected patient satisfaction.<sup>(16)</sup>

Retention of dentures refers to the resistance to displacement of the denture base from supporting tissue. Denture retention provided patients with psychological comfort.<sup>(26)</sup> There was a combination of various physical factors: adhesion, cohesion, interfacial surface tension, gravity, atmospheric pressure, oral and facial musculature, and border seal. Increasing the retention of dentures affected good OHRQoL. The retention of lower dentures was statistically related to the quality of life.<sup>(12)</sup> A study by Affadda *et al.*<sup>(12)</sup> indicated that the retention of lower dentures was related to OHRQoL. However, the retention of the upper denture was not associated with OHRQoL. It can be explained that increasing the number of objects may result in a correlation between lower denture retention and OHRQoL, as can be seen in a study by Limpuangthip *et al.*<sup>(15)</sup> which indicated that the retention of the upper and lower dentures was related to OHRQoL.

Furthermore, the tongue is an important organ that aids in the retention of dentures. Lee *et al.*<sup>(27)</sup> reported that when a patient's tongue touched the denture base on the lingual side of the lower denture, it helped the retention of the lower dentures.

The study results on the relationship between the esthetic of complete denture and OHRQoL were quite different. The studies assessing the esthetic of dentures by a dentist reported that the esthetic of a complete denture had no relationship with OHRQoL.<sup>(12,15)</sup> On the contrary, in a study by Komagamine *et al.*<sup>(14)</sup> in which the esthetic of complete dentures was assessed by patients, the esthetic of complete dentures impacted OHRQoL. This can be explained that the clinical evaluation used by the dentist, such as "the misalignment of the imaginary line between the pupil and the tip of the upper anterior teeth or the midline of the denture"<sup>(15)</sup> and "the angle between the base of the nose and the upper lip or lower lip line"<sup>(12)</sup>, may not be noticed by the patients. Meanwhile, when the esthetic of the denture was assessed by patients, the patients could perceive the abnormalities of the denture by themselves. Therefore, the esthetic of the dentures assessed by the patients was related to OHRQoL. The tools used for measuring OHRQoL regularly include Oral Health Impact Profile (OHIP)<sup>(28)</sup>, Oral Impacts on Daily Performance<sup>(29)</sup>,

and Geriatric/General Oral Health Assessment Index (GOHAI).<sup>(30)</sup> In this systematic review, the OHIP was found to be widely used for assessing OHRQoL in complete denture wearers.<sup>(12-14,16)</sup> When considering OHIP's advantages, it was found that (i) OHIP was developed based on interviews with patients in dental clinics and hospitals. Therefore, it can detect problems related to dentures. (ii) Psychometric properties of OHIP were widely accepted.<sup>(31-34)</sup> (iii) OHIP specifically inquired about problems related to teeth, oral, and dentures. (iv) OHIP has been implemented in many countries such as Thailand<sup>(35)</sup>, Germany<sup>(36)</sup>, China<sup>(37)</sup> and Sweden.<sup>(38)</sup>

The quality of dentures is related to patients' quality of life. It is not just wearing complete dentures, but it should be quality dentures. Therefore, clinicians should provide quality dentures to patients. When patients use dentures for a long time, the quality of the dentures may deteriorate. Therefore, patients should be regularly examined their denture quality.

The denture quality is an assessment from the dentist's point of view. Meanwhile, the quality of life is assessed from the patient's perspective. Therefore, the OHRQoL should be assessed from both the dentist's and the patient's point of view to be suitable for planning treatment, achieving treatment goals, and improving patient quality of life. Moreover, there should be a policy to develop factors affecting the OHRQoL of the patients, such as a program for routine denture check-ups.

It is noted that patients with limitations in physical and biological factors cannot be treated with good quality dentures by traditional technique. The patient needs to be treated with an implant-retained overdenture. Nevertheless, there are limitations due to the patient's economic status.

This systematic review, has limitations. Clinical trials cannot be conducted due to ethical reasons. Most of the included studies used the cross-sectional study model, in which a cause-effect relationship could not be concluded. A cohort study was used in two studies. These might affect the reliability of the synthesis data. Therefore, future studies should include determining the true relationship between the quality of dentures and OHRQoL.

## Conclusions

This research revealed the denture quality factors affecting OHRQoL, including maxillary stability and



retention, mandibular stability and retention, articulation, and esthetic. Clinicians should provide quality dentures to patients. However, patients should be regularly examined their denture quality to improve their quality of life.

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## Conflict of interest

The authors declare no conflict of interest.

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