Review

Oral health status and health-related quality of life: a systematic review

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Abstract: This study was conducted in order to identify the literature on oral health status and health-related QOL, review the findings systematically, and assess the association between them. We performed a literature search of reports published between January 1973 and June 2004, using five databases including MEDLINE. Only studies that used validated generic health-related QOL instruments were selected. The reviewers evaluated selected articles independently and resolved disagreements by consensus. A total of 1,726 articles were retrieved and seven were selected for the review; five observational studies and two intervention studies. Four studies showed significant associations between oral health status and health-related QOL. Temporomandibular disorders were highly associated with reduced health-related QOL. Poor oral status linked to both craniomandibular and cervical spinal pain was associated with increased impairment of health-related QOL. Dissatisfaction with the teeth and mouth, and a sensation of dry mouth contributed to reduce health-related QOL. Providing edentulous patients with implant-supported full dentures contributed to improve health-related QOL. Assessment of health-related QOL in relation to oral health with validated instruments remains insufficient. The present findings suggest that oral health status could affect health-related QOL in some settings; however, further evidence is needed to support this interpretation. (J. Oral Sci. 48, 1-7, 2006)

Keywords: QOL; oral health; health; systematic review.

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Introduction

Oral diseases such as dental caries or periodontal disease are highly prevalent and their consequences are not only physical; they are also economic, social and psychological. They seriously impair quality of life (QOL) in a large number of individuals and can affect various aspects of life, including oral function, appearance, and interpersonal relationships (1).

Reisine reported the need for a comprehensive approach to study the social and psychological impact of oral disease in the 1980s (2-4). Growing recognition of the importance of QOL in the field of dentistry has since led to the development of a number of oral health-related QOL instruments (5). The need to consider oral health as an integral part of health, and the contribution of oral health

to overall health-related QOL, has been stressed (6).

A recent Medline search found that the number of articles under the key words 'quality of life' and 'oral health' had increased dramatically. In fact, the number of articles published between 2000 and 2004 was three times higher than that between 1995 and 1999, and six times higher than that between 1990 and 1994. However, to date, no systematic reviews exist on oral health and health-related QOL.

In order to facilitate further research, we conducted a literature review of published articles. The purpose of this study was to identify the literature on oral health status and health-related QOL, review the findings systematically, and assess the association between them.

Materials and Methods

This literature study was part of the review project for "Oral Health and General Health", a study undertaken by a group of dental and medical practitioners, that began in April 2004. The study protocol is cited on the worldwide web (7). We addressed the following research questions: (1) "What kinds of evidence regarding oral health status and health-related QOL are available?" and (2) "What is the association between oral health status and health-related QOL?".

Definitions of "oral health" and "QOL" were consistent with those provided in the report "Oral Health in America" (8). In this classification, oral disease has six major categories: dental and periodontal infections, mucosal disorders, oral and pharyngeal cancers, developmental disorders, injuries, and certain chronic and disabling conditions including orofacial pain. Oral health is defined as freedom from chronic orofacial pain; oral and pharyngeal cancers; oral soft tissue lesions; birth defects such as cleft lip and palate; and other diseases affecting the oral, dental, and craniofacial tissues, collectively known as the craniofacial complex. This definition was used to formulate the search strings in the present study.

QOL is defined as an individual's perception of his or her position in life, in the context of the culture and value systems in which they live, and in relation to their goals, expectations and concerns (9). Health contributes to QOL, and the real impact of health and disease on QOL is known as health-related QOL. Health-related QOL is one dimension of a wider concept of QOL (10), and is defined in relation to optimum levels of mental, physical, role, and social functioning; it includes relationships, as well as perceptions of health, fitness, life satisfaction, and well-being (11).

Oral health-related QOL is defined as an individual's assessment of how the following affect his or her well-being: functional factors, psychological factors, social factors, and experience of pain/discomfort in relation to orofacial concerns (12). These definitions of health-related QOL and oral health-related QOL were used in the present study.

The following databases were used for the literature search: MEDLINE, EMBASE, Cochrane Library, Up To Date and Japana Centra Revuo Medicina. Table 1 shows the search strings for MEDLINE. The search term

Table 1 Search strings for MEDLINE

#1	(Oral Health[mh] OR "Oral Health"[tw]) OR (Health Promotion[mh] OR "Health Promotion"[tw]) OR (Health Status Indicators[mh] OR "Health Status Indicators"[tw]) OR (Periodontal Diseases[mh] OR "Periodontal Diseases"[tw]) OR (Dental Caries[mh] OR "Dental Caries"[tw]) OR (Mouth Neoplasms[mh] OR "Mouth Neoplasms"[tw]) OR (Mouth Diseases[mh] OR OR "Mouth Diseases"[tw]) OR (Dental Health Services[mh] OR "Dental Health Services"[tw]) OR (Craniofacial Abnormalities[mh] OR "Craniofacial Abnormalities"[tw]) OR (Fluoridation[mh] OR "Fluoridation"[tw]) OR (Oral Hygiene[mh] OR "Oral Hygiene"[tw]) OR (Craniomandibular Disorders[mh] OR "Craniomandibular Disorders"[tw]) OR (Dental Care[mh] OR "Dental Care"[tw]) OR (Focal Infection, Dental[mh] OR OR "Focal Infection Dental"[tw]) OR (Endodontics[mh] OR Endodontics[tw])
#2	Dentistry[mh] OR Mouth Diseases[mh] OR Tooth Diseases[mh] OR Oral Health[mh] OR Jaw Diseases[mh] OR Craniofacial Abnormalities[mh] OR Dental Health Services[mh] OR Head and Neck Neoplasms[mh] OR Dentistry[tw] OR "Mouth Diseases"[tw] OR "Tooth Diseases"[tw] OR "Oral Health"[tw] OR "Jaw Diseases"[tw] OR "Craniofacial Abnormalities"[tw] OR "Dental Health Services"[tw] OR "Head and Neck Neoplasms"[tw]
#3	hominidae[mh] OR Human[mh]
#4	(#1 AND #2) AND #3
#5	(quality of life[mh] OR "quality of life"[tw]) OR (activities of daily living[mh] OR ADL[tw] OR "activities of daily living"[tw]) OR (EQ-5D[tw] OR EuroQol[tw] OR NHP[tw] OR QWB[tw] OR SF-12[tw] OR SF-36[tw] OR SIP[tw])
#6	1973/01:2004/06[dp]
#7	#4 AND #5 AND #6

"activities of daily living" (ADL) was also included in the strings because studies may have evaluated QOL as one of the factors contributing to ADL. The Quality of Well-Being Scale, which was one of the targeted health-related QOL instruments in the inclusion criteria, was first introduced in 1973 (13). We therefore searched for reports published between January 1973 and June 2004. The literature search was performed in July 2004.

The following intervention and observational studies were included: (1) intervention studies that assessed the subject's QOL before and after the intervention, (2) intervention studies that compared QOL in an intervention and a control cohort, and (3) observational studies comparing QOL in subjects with oral/dental diseases and in controls. Studies that examined the maintenance of health-related QOL or the increase/decrease of health-related QOL were included.

Only studies that used health-related QOL assessment with six validated generic QOL instruments were selected. These instruments were the Sickness Impact Profile (SIP) (14), the Nottingham Health Profile (15), the Short-Form 36 Health Survey (SF-36) (16), the Short-Form 12 Health Survey (17), the EuroQol Quality of Life Scale (18) and the Quality of Well-Being Scale (QWB), (19,20). The present study focused on the relationship between oral health and health-related QOL. Studies that used health-related QOL as an outcome were selected and those using only oral health-related QOL as an outcome were excluded. We excluded narrative reviews and studies involving patients who had undergone treatment that could have altered their oral environment, such as radiotherapy and/or chemotherapy for maxillofacial trauma. Studies involving patients with oral mucosa disease with both oral and other systemic symptoms (such as Behçet's disease and Sjögren's syndrome), were also excluded because factors not related to oral health might also have affected subjects' health-related QOL.

Articles were selected and reviewed by two reviewers. First, each reviewer independently selected the articles from their abstracts. Second, they checked the contents of these selected articles and those without abstracts. Articles that did not clearly fulfill the criteria described above were excluded. The eligibility of selected articles was discussed. When two reviewers disagreed on the inclusion of an article, a third reviewer's opinion was sought for further discussion. Agreement between two reviewers (κ) was calculated when determining the validity of reviewed studies. After selecting the reviewed articles, the reviewers evaluated all articles independently and resolved disagreements by consensus.

Results

1. Literature search and article selection

A total of 1,726 articles from 1973 to 2004 were retrieved, comprising 1,348 from MEDLINE and 378 from other medical databases. Two reviewers checked and then selected six and seven articles respectively (Fig. 1). All selected articles were original studies listed on MEDLINE. The most common reason for exclusion was either a lack of description of overall QOL or inclusion of cancer patients. Several studies were also excluded that involved patients with certain health conditions that could alter the oral environment. The two reviewers disagreed on the inclusion of three of the retrieved articles, owing to differing interpretations of the inclusion criteria. After consulting a third reviewer, one of these articles was excluded because the subject's QOL before an intervention had not been assessed. The remaining two articles were finally included. A total of seven articles (21-27) were selected for the present study. The κ value indicating agreement between the two reviewers was 0.77 (95% CI: 0.51-0.99).

2. Classification of articles

Five observational studies and two intervention studies were reviewed (Tables 2 and 3). The observational studies consisted of four cross-sectional studies (21-23,25) and a case-control study (24). The intervention studies consisted of a clinical trial (26) and a randomized controlled trial (27).

Observational studies were concerned with dental and periodontal infections (21-24), temporomandibular disorders (TMD) (21) or orofacial pain (25). All intervention studies concerned outcomes in edentulous patients treated with dentures. None of them assessed how improvement in oral health due to oral care might affect health-related QOL.
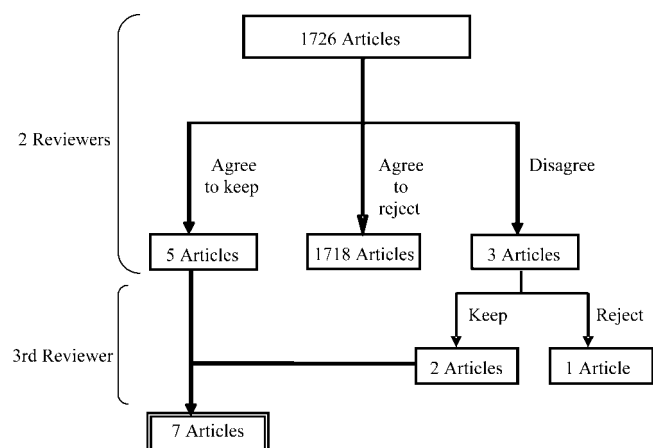

Fig. 1   The screening process to select articles for the review.

Table 2 Selected articles: observational studies

Year published	Study design	Subjects	Number of subjects	Oral health variables	HQOL instruments	OHQOL instruments	Association between HQOL and oral health status	Reference
1989	Cross-sectional study	TMD patients	48	TMD, Periodontal disease, Wearing dentures	SIP	-	TMD patients ranked lower on QOL, followed by denture and periodontal disease (p<0.001).	21
		Periodontal patients	33					
		Denture patients	23					
		Recall patients	48					
1999	Cross-sectional study	Edentulous patients with a history of difficulty wearing conventional dentures requesting dental implants	32	Tooth loss, Satisfaction with conventional dentures	SF-36	+	ns	22
		Edentulous patients requesting the replacement of their conventional dentures	35					
		Dentate patients	21					
2000	Cross-sectional study	Adolescents aged between 12 and 17	76	DMFS*	SF-36	+	ns	23
2003	Case-control study	Age-matched and gender-matched non-diabetic subjects	102	Tooth loss, Satisfaction with teeth and mouth, Oral dryness	SF-36	-	Diabetes subjects with few remaining teeth scored lower in PF and RP than those with ≧20 teeth (p<0.01). Dissatisfaction with the mouth and sensation of oral dryness was associated with lower scores in BP, VT and MH (p<0.001)†.	24
		Type 2 diabetes subjects	102					
2004	Cross-sectional study	Subjects with no pain	36	Craniomandibular pain, Cervical spinal pain, Widespread pain	RAND-36‡	-	Subjects with both craniomandibular and cervical spinal pain showed lower scores in all health domains than those with no pain (p<0.01).	25
		Patients with craniomandibular pain alone	12					
		Patients with cervical spinal pain alone	6					
		Patients with both craniomandibular and cervical spinal pain	49					

*Dental caries prevalence
†Financial status was adjusted.
‡The Dutch version of the SF-36
TMD, Temporomandibular disorders; ns, not significant
HQOL, Health-related QOL; OHQOL, Oral health-related QOL
PF, Physical functioning; RP, Role-physical; BP, Bodily pain; VT, Vitality; MH, Mental health

Table 3 Selected articles: intervention studies

Year published	Study design	Experimental group			Comparison group			HQOL instruments	OHQOL instruments	Association between HQOL and oral health status	Reference
		Subjects	Number of subjects	Treatments	Subjects	Number of subjects	Treatments				
2003	Clinical trial	Edentulous/edentate subjects and subjects requesting implants	26	Prostheses supported by implants	Dentate patients	20	Routine conservation and simple periodontal treatments	SF-36	+	ns	26
		Edentulous/edentate subjects and subjects requesting implants	22	Conventional dentures							
		Edentulous patients requesting the replacement of their conventional dentures	35	Conventional dentures							
2003	Randomized controlled trial	Edentulous patients	30	Mandibular overdentures retained by two implants and conventional maxillary dentures	Edentulous patients	30	Conventional full dentures	SF-36	+	The experimental group scored higher on post-treatment in RE, VT and SF than those on pre-treatment (p<0.05).	27

ns, not significant
HQOL, Health-related QOL; OHQOL, Oral health-related QOL
RE, Role-emotional; VT, Vitality; SF, Social functioning

The following health-related QOL instruments were used in the selected studies: the SF-36 in six studies (22-27), and the SIP in one study (21). Four studies used both health-related QOL and validated oral health-related QOL instruments (22,23,26,27).

3. Quantitative research synthesis and qualitative analysis

None of the articles provided data necessary to perform a quantitative synthesis of research results. Three observational studies and one intervention study found associations between oral health status and health-related QOL. One observational study concerning TMDs indicated that they were highly associated with reduced health-related QOL (21). Tooth loss in type 2 diabetes subjects and poor oral status with both craniomandibular and cervical spinal pain were associated with increased impairment of health-related QOL (24,25). Dissatisfaction with the teeth and mouth, and a sensation of dry mouth contributed to a reduction in health-related QOL (24). However, edentulous jaws, periodontal disease, and increased dental caries were not correlated with health-related QOL (22,23). One intervention study indicated that providing edentulous patients with implant-supported, full dentures contributed to improved health-related QOL (27).

Discussion

A total of 1,726 articles were retrieved and seven articles (five observational and two intervention studies) were selected for the review. Four of these seven studies found associations between oral health status and health-related QOL.

Dental caries and periodontal disease have historically been considered the most important global oral health burdens. Moreover, tooth loss and impaired oral function have come into focus as health problems in recent years (28). It should be noted that the growing incidence of diabetes may further impact negatively on oral health (28). The topics covered by the selected articles in this review followed this trend in the oral health field.

A lack of evidence concerning the association between oral health and health-related QOL implies that a lack of suitable instruments for measuring oral health has impeded research progress. For instance, although the number of teeth is one measure of oral health status, individuals with no teeth can, in some cases, chew much better than those with partial dentures (29). This needs to be considered when addressing oral health.

One indicator of oral health is the number of remaining teeth. However, Gift (29) has suggested that it is difficult to assess dental function and esthetic condition using the number of teeth without data on prosthetic work. Oral satisfaction among people with an edentulous jaw who have dentures has been reported to be relatively high (30), suggesting that the association between the number of remaining teeth and difficulty with everyday activities is far from definite. Allen et al. have also shown that the edentulous jaw is not correlated with health-related QOL (22). When considering how the number of teeth and oral satisfaction affect health-related QOL, it may be necessary to take into account other factors such as the subject's physical health and level of awareness regarding oral health.

In assessing the association between health status and health-related QOL, Heydecke (27) suggested that both specific and generic instruments be used. To examine what impact the maintenance and/or improvement of oral health has on health-related QOL, it is essential to collect evidence from several studies that evaluate health-related QOL. Discussion of the validity of QOL instruments is also needed. Several studies have indicated a problem regarding the use of original QOL instruments that have not been tested for validity or reliability (31,32). Our study required articles to use established instruments, which may have limited the number of articles used. Further assessment of health-related QOL with valid instruments is needed.

Four of the seven studies indicate an association between oral health status and health-related QOL. This suggests that oral health status can affect the impact of health-related QOL in patients with particular conditions. It should, however, be noted that reviewed articles were limited in methodological quality and variety. Hence, further research is needed to clarify this relationship, in light of the insufficient number and quality of articles reviewed in this study.

Our review found that only intervention studies examined functional recovery and that no studies focused on primary prevention. In the field of oral health, it is still uncommon for intervention studies on primary prevention to assess outcomes relating to or concerning health-related QOL. Further research is accordingly needed on the importance of health-related QOL in the context of oral health promotion. Moreover, there were no studies on mal-occlusion and orthodontic conditions. Most orthodontic conditions are asymptomatic and relate to esthetics; therefore, generic health-related QOL may not be an appropriate measurement in many cases, particularly in relation to treatment needs and outcomes. Cunningham et al. (33) have suggested that there has been little research undertaken in the field of orthodontics and health-related QOL, and have recommended health-related QOL

assessment in future research.

It cannot be denied that publication bias may have reduced the number of reports included. In particular it should be mentioned that if observational studies do not show statistically significant results, it is often difficult for these studies to be published. Although oral health status may have some impact on health-related QOL, it is not easy to evaluate the extent of this impact. It will also be necessary to determine whether this impact is meaningful in the clinical setting. More evidence of this kind is therefore needed.

Acknowledgments

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