



Adult Oral Health Related Quality Of Life Instruments: A Systematic Review.

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Keywords:	Oral Health Related Quality of Life, Factor Analysis, Validity, Patient Reported Outcome Measures
Abstract:	To identify the existing OHRQoL instruments for adults, describe their scope (generic or specific), theoretical background, validation type, and cross-cultural adaptation. Methods: A systematic search was conducted and articles presenting validation of OHRQoL instruments in adults were included. Data were collected about the validation type: external validation (correlations/associations); or internal validation (Factor Analysis/Principal Components Analysis, Item Response Theory); and cross-cultural adaptation. Results: Of 3730 references identified, 326 were included reporting 392 studies. Forty-two original instruments were found among 74 different versions, 40 generic and 34 condition-specific. Locker's theoretical framework was the predominant model. The Oral Health Impact Profile (OHIP) presented 20 versions, with OHIP-14 being the most frequent (26.8%), followed by Geriatric Oral Assessment Index (GOHAI) (14.0%), OHIP-49 (11.7%) and Oral Impacts on Daily Performances (OIDP) (9.7%). Most studies focused on external validation (65.3%), while internal validation was reported in 24.8% (n=26) of OHIP-14 studies, 50.9% (n=28) of GOHAI, and 21.1% (n=8) of OIDP studies. Most internal validation studies were conducted in English-speaking countries (n=33), and cross-cultural adaptation mostly in non-English-speaking European countries (n=40). Conclusions: Many generic and condition-specific instruments were found, but few have gone through a rigorous internal validation process or have undergone cross-cultural adaptation. This, in turn, makes it difficult for researchers to choose an appropriate measure based on known psychometric properties. OHIP-14, OIDP and GOHAI seem to be the most widely validated instruments. Equalising measurement properties for comparability is challenging due to theoretical heterogeneity. Future studies should assess psychometric properties, explore the factorial

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	structure, and work towards a consensus on critical issues.



Adult Oral Health-Related Quality Of Life Instruments: A Systematic Review.

Running Head: OHRQoL Instruments: Systematic Review

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ABSTRACT

To identify the existing OHRQoL instruments for adults, describe their scope (generic or specific), theoretical background, validation type, and cross-cultural adaptation.

Methods: A systematic search was conducted and articles presenting validation of OHRQoL instruments in adults were included. Data were collected about the validation type: external validation (correlations/associations); or internal validation (Factor Analysis/Principal Components Analysis, Item Response Theory); and cross-cultural adaptation. **Results:** Of 3730 references identified, 326 were included reporting 392 studies. Forty-two original instruments were found among 74 different versions, 40 generic and 34 condition-specific. Locker's theoretical framework was the predominant model. The Oral Health Impact Profile (OHIP) presented 20 versions, with OHIP-14 being the most frequent (26.8%), followed by Geriatric Oral Assessment Index (GOHAI) (14.0%), OHIP-49 (11.7%) and Oral Impacts on Daily Performances (OIDP) (9.7%). Most studies focused on external validation (65.3%), while internal validation was reported in 24.8% (n=26) of OHIP-14 studies, 50.9% (n=28) of GOHAI, and 21.1% (n=8) of OIDP studies. Most internal validation studies were conducted in English-speaking countries (n=33), and cross-cultural adaptation mostly in non-English-speaking European countries (n=40). **Conclusions:** Many generic and condition-specific instruments were found, but few have gone through a rigorous internal validation process or have undergone cross-cultural adaptation. This, in turn, makes it difficult for researchers to choose an appropriate measure based on known psychometric properties. OHIP-14, OIDP and GOHAI seem to be the most widely validated instruments. Equalising measurement properties for comparability is challenging due to theoretical heterogeneity. Future studies should assess psychometric properties, explore the factorial structure, and work towards a consensus on critical issues.

Keywords: Oral Health-Related Quality of Life, Factor Analysis, Validity, Patient-Reported Outcome Measures.

INTRODUCTION

Oral Health-Related Quality of Life (OHRQoL) studies date back to conceptual models in the early '80s^{1,2} - based on the International Classification of Impairments, Disabilities and Handicaps (ICIDH) - and have been growing fast since the mid-90s³. Locker et al. defined OHRQoL as the extent to which oral disorders affect functioning and psychosocial well-being¹. Similarly, the World Health Organization (WHO) defines Health-Related Quality of Life (HRQoL) as "*individuals' perception of their position in life in the context of the culture and value systems in which they live and in relation to their goals, expectations, standards and concerns*". It is a broad and complex concept influenced by a person's physical health, psychological state, level of independence, social relationships, personal beliefs, and relationship to salient features of their environment⁴.

Many measurement tools have been developed and validated to assess the degree of impact that oral health has on Quality of Life (QoL). Different from normative clinical measures, they include the subjective perceptions of individuals about their oral health. QoL instruments have been used in epidemiological surveys and clinical trials; guided health policies to incorporate patient-centred approaches, and assessed treatment needs^{5,6}. OHRQoL can be understood as a latent variable and, as such, can only be evaluated indirectly through composite measures⁷. Furthermore, it is a culturally sensitive concept, reflecting perceptions and norms that vary in different contexts⁸. Instruments, sometimes called measures or questionnaires, may be developed for specific age groups. Children, adults, and older adults have usually been focused on separately. Such measures may also be classified according to their scope, either generic or specific⁹.

The development of an instrument is a long process, and validating it is part of this process¹⁰. Initially, theoretical validation includes assessing the instrument concept and background, followed by face and content validation of proposed items. Then, internal validity assesses the dimensional structure of items, usually using factor analysis and related techniques in addition to commonly used internal consistency indicators (e.g., Cronbach's alpha). Finally, external validity is assessed with constructs theoretically related to the instrument, based on a strong *a priori* hypothesis

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3 about how they covary, with the purpose to assess whether the instrument measures
4 what is intended from a conceptual stance.
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8 OHRQoL instruments have been extensively used in dental research to assess the
9 impact of different oral conditions on daily life, beyond the setting in which they were
10 initially developed. When an instrument requires use in a different culture, it needs to
11 undergo a rigorous cross-cultural adaptation process^{11,12}.
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16 To date, to the best of the authors' knowledge, there is no systematic review of
17 OHRQoL instruments, much less concerning their respective developmental histories,
18 be them theoretical or empirical. Such information would help researchers in selecting
19 the most appropriate one in a specific setting and context. Therefore, this study aimed
20 to identify the existing OHRQoL instruments for adults and describe their scope
21 (generic or specific), theoretical background, validation type, and cross-cultural
22 adaptation.
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32 **METHOD**

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34 Two research questions were **addressed**: "*Which are the available oral health-related*
35 *quality of life instruments for the adult population?*" and "*Which validation methods*
36 *have been mostly used?*" A search strategy was developed combining two groups of
37 strings: 1) OHRQoL terms and 2) a high-sensitivity filter to retrieve validation studies
38 proposed by the COSMIN initiative¹³. This strategy was developed using PubMed
39 controlled vocabulary (MeSH terms) and then adapted for Scopus (see supplemental
40 file). To include grey literature, a Google Scholar search was run, and references of
41 two books^{9,14}, two previous revisions^{15,16}, and included articles were scrutinised to
42 detect additional papers not retrieved in the search. **In addition**, authors of identified
43 instruments were contacted by e-mail if further information was needed.
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53 ***Selection criteria***

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55 Articles assessing psychometric properties of OHRQoL instruments in the adult
56 population were included without language or year limits until April 2021, the review is
57 registered in Prospero (CRD42018110341). Psychometric information was also
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3 extracted from studies in which the primary purpose was not the validation of an
4 OHRQoL instrument but presented results about it. We excluded studies during any
5 selection step: a) in which the whole sample was under 18 years old; b) that did not
6 include psychometric analysis; c) not involving a QoL instrument; and d) that were
7 review, animal, or laboratory articles. Instruments with fewer than three items were
8 dropped¹⁷.
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14 ***Data extraction and study variables***

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17 Once potential studies were identified, two researchers (FR and MCS) read all the
18 titles and abstracts, if there was insufficient information for a decision, the article was
19 selected for full text reading. In case of disagreement, a third author (RKC or GS) was
20 consulted, but only 45 cases remained unclear out of 3730 titles/abstracts screened.
21 Subsequently, the following information was extracted **on the**: (i) development of the
22 instrument (original instrument or a new version); (ii) scope of the instrument (generic
23 oral health or condition-specific); (iii) main psychometric properties assessed (external
24 or internal validation); and (iv) whether or not the study involved a cross-cultural
25 adaptation process. In this regard, the eligibility criteria were if the authors explicitly
26 mentioned cross-cultural adaptation as the study aim or if a pre-established guideline
27 or necessary steps for a translation was employed. If the background of the instrument
28 was not clear, the original reference was consulted. Also, the following information
29 was sought: (i) first author; (ii) journal of publication; (iii) year of publication; (iv) country
30 of the study; (v) on whether validation of the OHRQoL instrument was one of the
31 objectives; (vi) instrument name; (vii) the number of items; (viii) aim of the instrument
32 when developed; (ix) type of validation performed; and (x) data on the process of
33 cross-cultural adaptation.
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48 Several psychometric properties were reported in the included studies, and non-
49 exclusive categories were created based on available information. We classified as
50 addressing internal validation if an article reported results from a Principal Component
51 Analysis, an Exploratory or Confirmatory Factor Analysis; an Item Response Theory
52 model; or a Structural Equation Model. External validation was considered when any
53 association was identified between the instrument and another construct.
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RESULTS

The initial search identified 3730 references. Reading titles and abstracts excluded 3340 publications not fulfilling the eligibility criteria. The remaining 390 articles were read in full, 64 of which were subsequently excluded according to the specified eligibility criteria. As this study objective was to describe the process of instrument validation, and many articles covered more than one at a time and sometimes in different populations, the selected 326 articles effectively covered 392 validation studies (Figure 1).

Based on the data, the selected instruments were then classified into five features, namely, (i) name and the number of items; (ii) year of publication (1990- 2000, 2001-2005, 2006-2010, 2011-2015, and 2016-2021); (iii) journal of publication; (iv) language and country or group of countries of publication (a single country, group of countries, or multi-country according to cultural and language similarities); and (v) validation as an objective (yes or no).

Characteristics of the studies and the retrieved instruments

A total of 74 OHRQoL instruments were identified, all derived from 42 original versions. Regarding their aims, 40 were generic (18 original versions), and 34 were condition-specific OHRQoL questionnaires (24 original versions, 9 OHIP versions and 1 derived versions), the most frequent among the latter being aesthetic-, prosthetic-, and surgical-related instruments (Table 1). Their theoretical model was often difficult to establish because it was usually not explicitly specified^{1, 18–21}. Locker's framework was the most widely used, with four generic instruments (Oral Health Impact Profile - OHIP, Oral Impact on Daily Performances - OIDP, Geriatric Oral Assessment Index - GOHAI, Subjective Oral Health Status Indicators - SOHSI) and nine specific ones (OHIP-Temporomandibular disorders [two instruments], OHIP-Masticatory efficiency, OHIP-Edentulism, OHIP-Aesthetic, OHIP-Prosthodontics, OHIP-Periodontitis [two instruments], OPMDQoL [Oral Potentially Malignant Disorders]) (Figure S1 and Table 1).

The OHIP presented the highest number of variants with 20 versions. The instrument was also the most frequently validated; there were 105 validation studies (26.8%)

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3 about OHIP-14 and 46 (11.7%) about OHIP-49. The second most frequently assessed
4 measurement tool was the GOHAI, with 55 studies (14.0%), followed by the OIDP with
5 38 studies (9.7%) (Table S1).
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9 The group of journals with the highest number of publications were *Dental Journals*,
10 with 50.8% (Table S1). The number of publications has continuously been increasing
11 over time, peaking in the 2011-2015 period with 32.4% of the cases. The majority of
12 the studies were from English-speaking countries (USA, UK, Canada, Ireland,
13 Australia, New Zealand) with 25.6%; while other European countries represented
14 18.4%, and Brazil-Portuguese was the second-highest single-language group (8.9%)
15 (Table S1).
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22 **Type of validation**

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24 A larger number of studies carried out external (65.3%) over internal validation
25 (34.7%). The GOHAI was the only single instrument subjected to more internal than
26 external validation. Internal validation was reported in 24.8% (n=26) of the OHIP-14
27 studies, 21.1% of the OIDP (n=8) studies, and in 50.9% (n=28) of the GOHAI studies
28 (Table S1).
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35 The number of internal validation studies has been increasing over the years, peaking
36 in the 2016-2021 period (n=44), but external validity was more frequent than internal
37 validation in all periods (Table S1). Regarding the journals of publication, all groups
38 presented some form of external validity as the most common method of validation,
39 and *Dental Journals* had the highest number of both internal (n=67) and external
40 (n=132) validity studies (Table S1). Differences were found regarding the target
41 populations for internal validation (Table S1), the English-speaking countries having
42 most studies (n=33) followed by Brazil (n=15).
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50 **Cross-cultural adaptation**

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52 Cross-cultural adaptation was reported in 99 studies (Table S1), 25.3% of all studies.
53 GOHAI presented the highest percentage (34.6%) among all instruments. Cross-
54 cultural adaptation studies comprised 8.3% of validation studies in 1990-2000,
55 increasing over time with the highest percentage in 2015-2021 with 35.6%. The
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3 category of non-English-speaking European countries (Scandinavian,
4 Germany/Netherlands and all others) had the highest number of studies (n=40).
5 Because most instruments were developed in English, English-speaking countries
6 presented only one cross-cultural validation study each (Table S1).
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10 11 12 13 14 **DISCUSSION**

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17 **This review compiled all currently available** OHRQoL instruments and described their
18 theoretical background and the type of validation they have undergone so far. A variety
19 of theoretical models were described, and the most frequent was Locker's framework.
20 Internal validation was performed in 34.7% of the studies, and 25.3% published some
21 kind of cross-cultural adaptation. The number of internal validation studies was low in
22 the early periods, showing that this methodology was not popular during the
23 development of current generic instruments^{22,23}. Nevertheless, there were many
24 external validation studies, which is an essential aspect for a comprehensive
25 evaluation of their scope and performance.
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34 Some limitations should be highlighted. This review should not imply that any
35 instrument is better validated than the others or that any instrument is fully validated
36 because it was tested in several studies. This issue is an important point since only
37 the number of validation studies was addressed, **without detailing the psychometric**
38 **properties** and related statistical methods. For example, some studies reported that
39 several factors (domains) emerged from factor analysis of OHIP-14, **while others**
40 **reported only one factor**^{24,25}.
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47 Several well-known instruments have already undergone internal and external
48 validation process^{24–29}. For a start, the number of factors in an instrument should
49 mirror its theoretical dimensions; nonetheless, a rapid assessment shows a plethora
50 of different factorial solutions for the same instruments^{24–26,30–34}. It is unclear if this is
51 due to the different methodological approach. **For example, whilst** most studies use
52 classical theory (e.g., factor analysis), **one study** was found assessing the
53 performance over the latent trait score, using item response theory³⁵.
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3 A larger number of instruments (n=42) were identified in the current study than in
4 previous ones (n=14 and n=17)^{15,16}. Probably, this reflects the rising tendency to use
5 condition-specific instruments (most of them developed in the last decade), together
6 with the demand for shorter and easily applicable versions³⁶ for large surveys. Many
7 condition-specific instruments were found, and some authors suggested their use in
8 addition to generic ones to address clinically relevant factors²³. It should be noted that
9 many specific instruments are derived from generic ones; therefore, some overlap is
10 likely to exist either in background theory, items, and/or purpose. Our decision to
11 classify as generic/specific was based on the authors' recommendations, but
12 additional assessment of their properties is warranted.
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21 In the current study, an attempt was made to understand the relationship between the
22 instruments and their theoretical models (Figure S1). A recent scoping review found
23 nine models used in OHRQoL research³⁷, however it was not clear how much those
24 models were used for instrument development. Ideally, such development should start
25 from a theoretical model towards the generation of items, but this process is not always
26 clear. Sometimes, an instrument concept and dimensional structure are refined and
27 clarified after exploratory analysis. This aspect is evident in Table 1, where only a few
28 studies explicitly stated their specific theoretical models^{2,38-42}. The most frequent is
29 the Locker's model, which is based on ICIDH, superseded by the International
30 Classification of Functioning, Disability and Health (ICF)⁹. The former model follows
31 from disease to impairment; however, given a shift towards health and function has
32 been advocated, current instruments should be assessed under new theoretical
33 models⁹.
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45 Factor analysis provides information for internal validity by testing a postulated model
46 (dimensional structure) to evaluate whether it explains the observed data⁷. The
47 present work identified fewer publications addressing internal validation than external
48 validation, perhaps because researchers in the field are used to the latter type of
49 studies. Although factor analysis is not a new method, internal validation studies were
50 relatively scarce in the first analysed periods (1990-2000 and 2001-2005). Interpreting
51 OHRQoL scores are very important⁴³, and factor analysis studies^{24-26,28,29} can help in
52 this matter, refining scale properties and comparing results in different cultures,
53 promoting understanding of the underlying constructs that the instruments cover.
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3 Since OHRQoL is a culturally and dynamically defined concept⁴⁴, more cross-cultural
4 adaptations are desirable in different socio-cultural and linguistic domains and across
5 periods. Perceptions about what constitutes quality of life may change over time⁴⁵. A
6 relatively small number of cross-cultural adaptations assessing psychometric
7 properties may also be an issue⁴⁶. However, some studies may not have required
8 cross-cultural adaptation because we could not define when each instrument was
9 used in a setting different from where it was initially developed. Therefore, the
10 percentage of cross-cultural adaptations reported here should not be interpreted as
11 low or high. A key aspect for further analysis will be to investigate when those
12 instruments were used for the first time in a new setting/culture and assess in more
13 detail the adaptation process.
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23 Instruments described here have been applied in countries with languages and
24 cultures different from the original versions. The target population is an important
25 aspect to consider with assessing the validity of a measure, and a universalist
26 approach has usually been adopted in the course of cross-cultural adaptation^{11,12,47}.
27 Accordingly, qualitative studies could be considered part of the theoretical equivalence
28 process and contribute to incorporating cultural differences in the item pool.
29 Unfortunately, this has been scarcely reported in our findings.
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37 In conclusion, the present study is a step towards a more comprehensive analysis of
38 OHRQoL instruments and their theoretical background. The historical and current high
39 number of instruments offers a broad range of measurement options for different
40 settings. However, few have gone through a rigorous internal validation process or
41 cross-cultural adaptation, making it difficult for researchers to choose based on
42 psychometric properties. Although instruments are conceptually different, they may
43 have good psychometric properties; While OHIP-14, OIDP and GOHAI seem to be the
44 most widely validated instruments, their specific psychometric properties need to be
45 scrutinized. Equalising the measurement properties, and therefore allowing
46 comparisons may be challenging because of the lack of theoretical comparability.
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54 **Perhaps, instead of improving any specific instrument, work towards an international**
55 **consensus on oral health quality of life measures may help achieve agreement on**
56 **critical issues.**
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Figure 1 - Literature search flow diagram

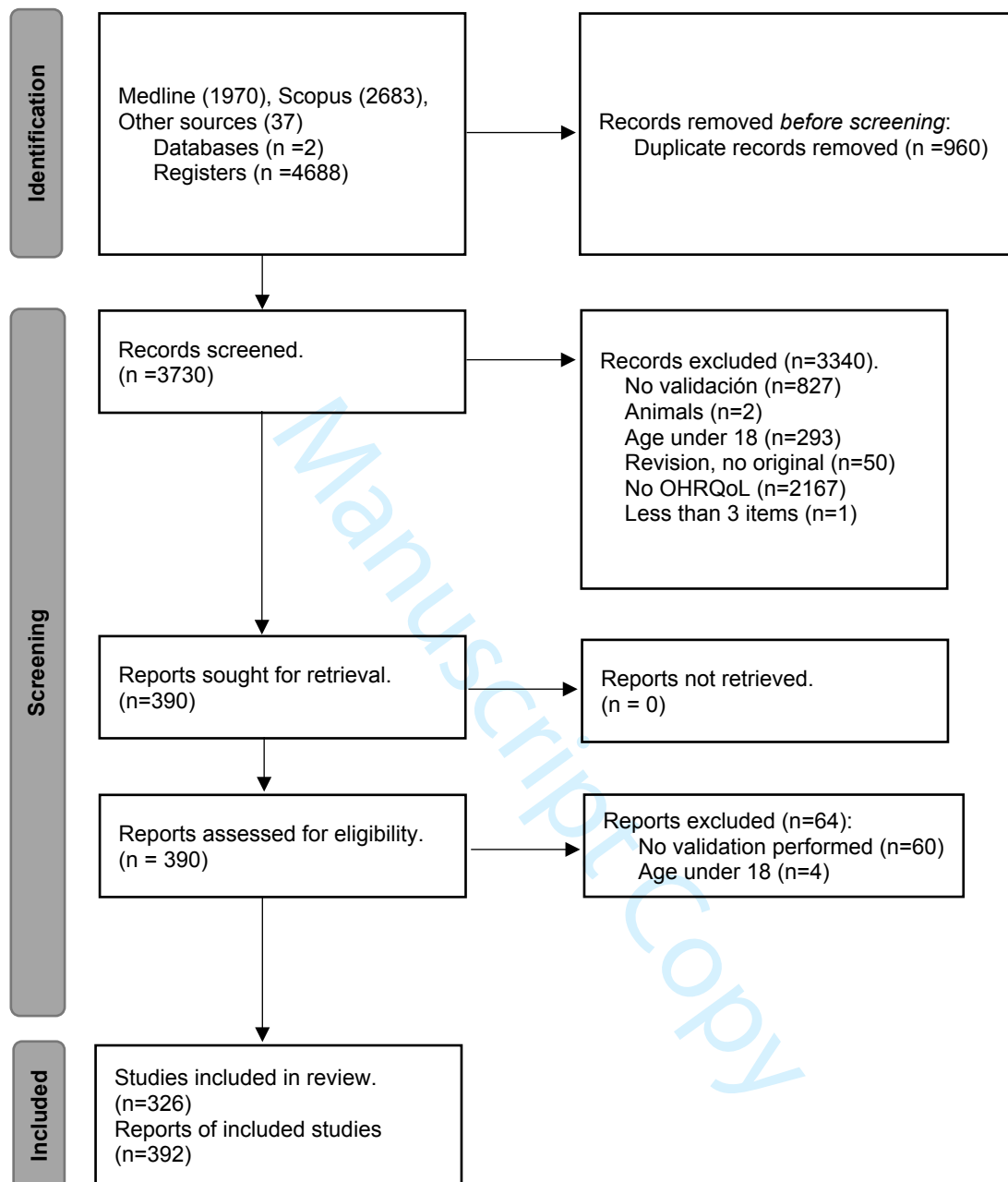


Table 1 – Retrieved OHRQoL instruments and aim (References available in Table S2)

Instrument name	Items (versions)	Concept (explicit in development article)	Proposed Dimensions (explicit in development article)	Origin of items	Languages - Countries
GENERIC INSTRUMENTS					
SIDD - Social Impacts of Dental Disease	14	Bio-psycho-social model applied to dental illness	5 - Functional, Social interaction, Comfort and wellbeing, Self-image	Qualitative interviews	English - England
GOHAI - Geriatric Oral Health Assessment Index	12	Locker's conceptual model (Not explicitly stated)	3 - Physical function, psychosocial function, Pain or discomfort	Literature review, consult with health care providers and patients, qualitative research	English - USA
DIP - Dental Impact Profile	25	Not explicitly stated	4* - Eating, Health/Well-being, Social relations, Romance	Qualitative interviews Pre-test on elderly and college age respondents	English - USA
OHIP - Oral Health Impact Profile	49 (14, 55, 54, 46, 45, 22, 7, 7, 5, 12sign leng.)	Locker's conceptual model	7 - Functional limitation, Physical pain, Psychological discomfort, Physical disability, Psychological disability, Social disability, Handicap	Interviews using open ended questions including adaptation of an existing inventory for handicap dimension	English - Australia
SOHSI - Subjective Oral Health Status Indicators	42	Locker's conceptual model	8 - Ability to chew, Ability to speak, Oral and facial pain symptoms, Other oral symptoms, Eating, Communication/social relations, Activities of daily living, Worry/concern.	Developed ad hoc over a series of studies comprised by preexisting indexes and scales	English - Canada
DIDL - Dental Impact on Daily Living	36 (49, 33)	Not explicitly stated.	5* - Comfort, Appearance, Pain, Performance, Eating	Open interviews, literature review and items in SIDD	English, Portuguese - England, Brazil
OHQOL - Oral Health Related Quality of Life Measure	3 (8)	Not explicitly stated.	1* - OHRQoL	From existing instruments	English - USA
OIDP - Oral Impact on Daily Performances	8 (7, 9, 10, 11, 12)	Last level of impact in Locker's conceptual model	3 - Physical, Psychological, Social	Qualitative research including existing sociodental and sociomedical measures	English, Thai - Thailand
OH-QoL - Oral Health Quality of Life Inventory	15	Not explicitly stated.	2 - Importance, Satisfaction	Synthesis of the literature and expert judgment	English - USA
ICSII-OHRQOL - Intern. Collaborative St. on Oral Health Care Systems	15	Not explicitly stated.	3 - Dental symptoms, Perceived oral well-being, Oral functioning	Not explicitly stated	English, Polish, German - New Zealand, Poland, Germany
Rand Health Insurance St.	3	Not explicitly stated.	1 - (Not specified)	Adapted from items of health measures	English - USA
Gadbury-Amyot 1999 - OHRQOL for Dental Hygiene	50	Extends the biomedical model including symptom status, functional status, and oral health perceptions	3 - Symptom status, Functional status, Oral health perception	Literature review OHRQoL measurement in dentistry, medicine, nursing, and physical therapy	English - USA
OHQoL-UK - Oral Health Quality of Life - UK	16	Not explicitly stated.	1* - Unnamed	Open ended interviews	English - UK
FIS - Family Impact Scale	14 (8, 19)	Not explicitly stated.	3* - Parental/family activity, Parental emotions, Family conflicts	Review of existing OHRQoL instruments and qualitative interview	English - Toronto
LORQ (v1-v3) - Liverpool Oral Rehabilitation Quest.	V1 - 25 V3 - 40	Not explicitly stated.	V1 - 2 - Oral function, Denture satisfaction V3 - 4 - Adds Oro-facial appearance, Social interaction	Clinical experience and review of existing instruments	English - England
OQOL - Oral Quality Of Life	12 (6)	Framework adapted from various models. Concept not explicitly stated.	4 - Physical function, Psychosocial functioning, Impairment or disease, Perceptions	Items from OHIP, GOHAI and OHQOL	English - USA
POHW - Positive Oral Health and Wellbeing	17	Positive oral health attributes and perceptions, may result, via appropriate oral health behavior, on positive oral health	2* - Good feelings, Positive impact	Expert's judgement	English, German, and Hebrew - USA, Germany, Israel
OHIDL - Oral Health Impact on Daily Life	20	Concept not explicitly stated. Qualitative approach to subjects' values of importance.	8* - Cleaning, Eating, Speaking, Appearance, Social, Psychological, Health, Finance	Semi-structured interviews to patients of the target population (Chinese elders)	Chinese - China

SPECIFIC INSTRUMENTS

1					
2	OHIP-30TMD - OHIP for	30	Based on OHIP (Locker's model)	6 - Functional limitation, Psychological discomfort,	Items from OHIP and specific TMD-Pain items
3	Temporo-mandibular disorders			Physical disability, Psychological disability, Social	from unspecified source
4				disability, Handicap	English - Canada
5	Savin1997 - QoL after	11	Not explicitly stated.	5 - Eating, Speech, Physical effect, Appearance, Other	Expert's judgement
6	removing of impacted lower			aspects of treatment	English - UK
7	wisdom				
8	OQLQ - Orthognathic Quality	22	Not explicitly stated.	4* - Social aspect of deformity, Facial aesthetics,	Literature review and interviews with health
9	of Life Questionnaire			Function, Awareness of facial deformity	professionals and patients.
10					English - UK
11	XeQoLS	15	Not explicitly stated	4 - Physical functioning, Personal/psychological	Not explicitly stated
12				functioning, Social functioning, Pain/discomfort issues	English - USA
13	Okamoto et al - QoL in patient	(16 - 18)	Not explicitly stated.	5 - Mastication and oral pain, Pronunciation,	Items from OHIP
14	with fixed prosthesis**			Swallowing, Oral cleaning, Aesthetic	Japanese - Japan
15					
16	OHIP-EDENT - OHIP for	19 (20)	Based on OHIP (Locker's model)	7 - Functional limitation, Physical pain, Psychological	Items from OHIP selected by item impact
17	edentulous patients			discomfort, Physical disability, Psychological disability,	method
18				Social disability, Handicap	English - Canada, UK
19	LDF-TMDQ - Limitations of	10	Not explicitly stated.	3* - Limitation in executing a certain task, Limitation of	Previous clinical research and patients'
20	daily function-TMD			mouth opening, Limitation of sleeping	feedback
21	questionnaire				Japanese - Japan
22	Manchester Orofacial Pain	32	Not explicitly stated.	2 - Physical, Psychological	Patients interview, and expert's judgement
23	Disability Scale				English - UK
24	PIDAQ -Psychosocial Impact	23	Not explicitly stated.	4* - Dental self-confidence, Social impact,	Items from OQLQ, literature review, and
25	of Dental Aesthetics Quest.			Psychological impact, Aesthetic concern	expert's judgement
26					Not clear in development
27	MHISS - Mouth Handicap is	12	Not explicitly stated.	3* - Restriction in mouth opening, Mouth dryness,	Patients interview, literature review of scales
28	Systemic Sclerosis scale			Aesthetic concerns	concerning the mouth, and expert's judgement
29					French - France
30	OHIP Aesthetic - OHIP for	14	Based on OHIP (Locker's model)	7 - Functional limitation, Physical pain, Psychological	Items from OHIP selected by stepwise
31	dental aesthetics			discomfort, Physical disability, Psychological disability,	procedure after FA
32				Social disability, Handicap	Chinese - China (Hong
33					Kong)
34	SOOQ - Surgical Orthodontic	33	Not explicitly stated.	5 - Issues before surgery, Issues after surgery, Dental	Reviews of the literature on motivations for
35	Outcome Questionnaire			aesthetics, Facial aesthetics, Emotional and social	treatment, reviews of existing OHRQoL
36				well-being	measures, (OHIP, COHQoL, OQLQ), and
37					expert clinical opinion
38			Unidimensional Construct reflecting		
39	OES - Oral Esthetic Scale	8	patients perceived esthetic values,	1* - Aesthetics	Patients interviews, focus group of dental
40			measuring the direct or primary		professionals, pre-test group
41			esthetic impacts.		Swedish - Sweden
42	DHEQ - Dentine	48	Relationship between clinical status,	8 - Pain, Functional restrictions, Adaptation,	Qualitative interviews
43	Hypersensitivity Experience		symptoms, functioning, perceived	Avoidance, Social impact, Emotional impact, Identity,	English - Canada
44	Questionnaire		health and overall quality of life	Effect on life overall	
45					
46	PQL - Prosthetic quality of life	11	Not explicitly stated.	3* - Physical well-being, Psychological well-being,	Qualitative interviews and expert's panel
47				Social well-being	based on studies assessing OHRQoL of
48					patients with removable prosthesis
49					Spanish - Spain
50	OHIP-22TMD - OHIP for	22	Based on OHIP (Locker's model)	7 - Functional limitation, Physical pain, Psychological	Items from OHIP selected by a mixed
51	Temporo-mandibular disorders			discomfort, Physical disability, Psychological disability,	quantitative and qualitative method
52				Social disability, Handicap	English - UK
53	COMDQ - Chronic Oral	26	Not explicitly stated.	4 - Pain and functional limitations, Medication and	Literature review, expert's judgement, and
54	Mucosal Diseases			treatment, Social and emotional, Patient support	qualitative interviews (focus group)
55	Questionnaire				English - Ireland
56	HALT - Halitosis Associated	20	Not explicitly stated.	Unspecified	Modified Items from SF-36, OHIP-14, OQLQ.
57	Life-quality Test				Patient interviews
58					English - USA

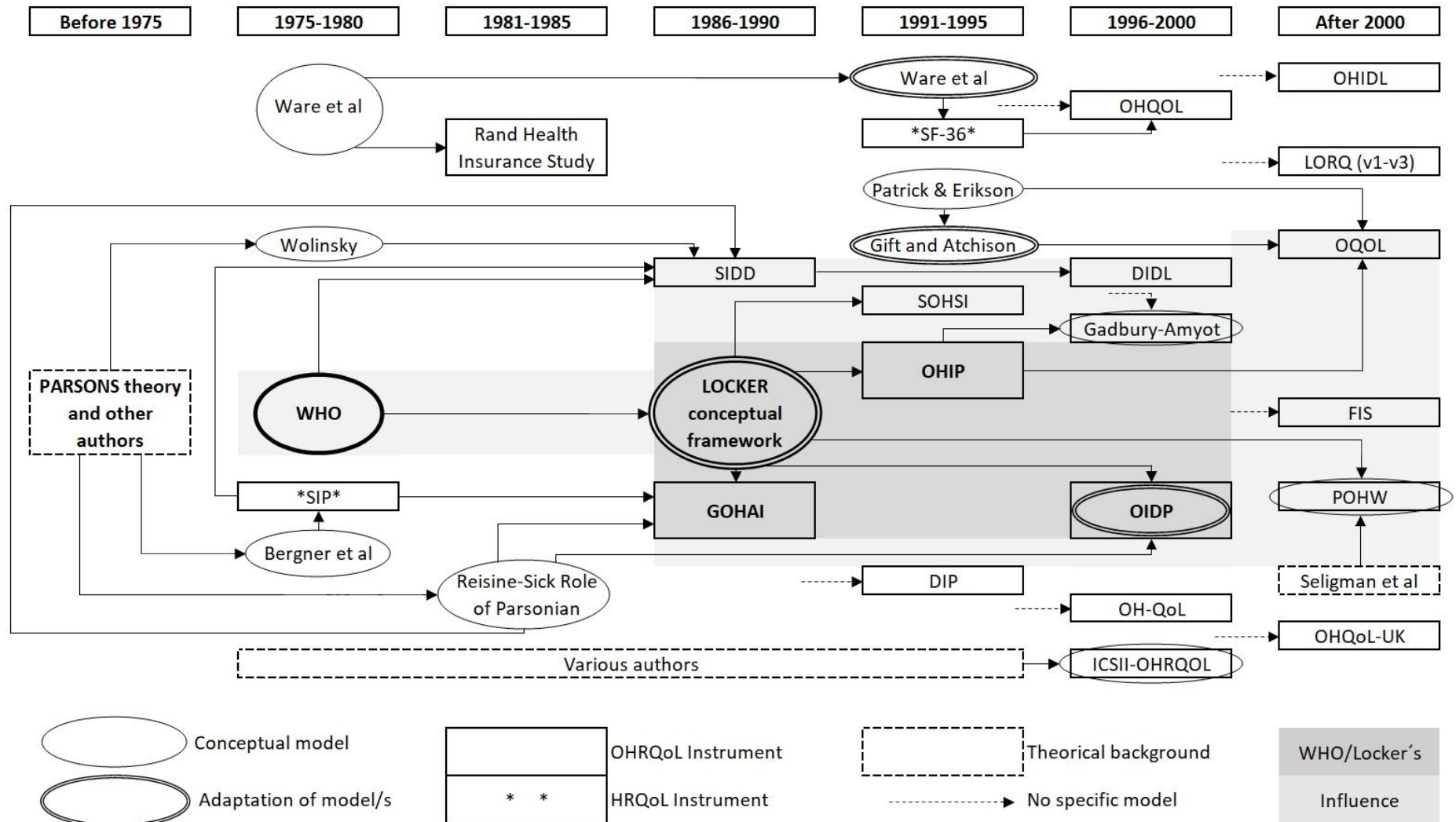
1	Musurlieva 2012 - Impact of Periodontal diseases	9	Not explicitly stated.	3 - Choice of food/nutrition chewing swallowing talking, Social relations, Overall health	Not specified	Bulgarian - Bulgaria
2	OHIP-13-POST OHIP for post prosthetic treatment	13	Based on OHIP (Locker's model)	7 - Functional limitation, Physical pain, Psychological discomfort, Physical disability, Psychological disability, Social disability, Handicap	Items from OHIP-EDENT	Spanish - Spain
4	EORTC QLQ-OH17 - European Org. for Research and Treat. of Cancer QoL Quest. Oral supplement	17	Not explicitly stated.	4 - Pain/discomfort, Xerostomia, Eating, Information. And three single items related to use of dentures and future worries	Literature review, semi-structured interview to healthcare professionals and patients	English, Dutch, Swedish, French, German, Greek, Hebrew, Norwegian - Europe
8	QoLIP-10 - Quality of Life with Implant-Prostheses	10	Not explicitly stated.	3 - Biopsychosocial dimension, Dental-facial aesthetics dimension, Performance dimension	Literature review, experts' judgment, patients' interviews	Spanish - Spain
9	OHIP-7-ME - OHIP for Masticatory efficiency	7	Based on OHIP (Locker's model)	Unspecified	Items from OHIP about perceived masticatory efficiency and a clinical test	French, English - Canada
11	QoLDAS-9 - Quality of Life associated with Dental Aesthetics Satisfaction	9	Not explicitly stated.	3* - Psycho-facial aesthetics, Interactive aesthetics, Socio-dental aesthetics.	Literature review, expert's judgment, patients' interviews and focus groups	Spanish - Spain
13	TOQOL - Teen Oral Health Quality of Life***	16	Gift and Atchinson's conceptualization	5 - Physical functioning, Role functioning, Social functioning, Oral problems, Emotional functioning	Literature review, Focus group interviews, Experts' judgment, Factor analysis	English - USA
15	OPMDQoL - Oral Potentially Malignant Disorders QoL	20	Modified from the OIDP theoretical framework (Locker's model)	4* - Difficulties with diagnosis, Physical impairment and functional limitations, Psychological and social wellbeing, Effect of treatment on daily life	Qualitative data and review of existing questionnaires	Telugu, English - India
18	OHIP-CP - OHIP for Chronic Periodontitis	18	Based on OHIP (Locker's model)	3 - Pain and functional limitation, Psychological discomfort, Psychological disability and social handicap	OHIP-49, focus groups with patients and expert's panel	Chinese - China
21	OHIP-14-PD - OHIP-14 for Periodontal Disease	14	Based on OHIP (Locker's model)	7 - Functional limitation, Physical pain, Psychological discomfort, Physical disability, Psychological disability, Social disability, Handicap	Adapted from OHIP-14 based on the Periodontal Disease Classification System of the American Academy of Periodontology and information provided by patients	Spanish - Mexico
23	OHRQoL-OSF - Oral Health Related Quality of Life-Oral Submucous Fibrosis	17	Not explicitly stated.	4 - Discomfort and functional impairment, Psychological wellness, Physical wellness, Social wellness	Focus group interviews, personal interviews, and expert's judgment	English - India
26	SCOOHP - Schizophrenia Coping Oral Health Profile	23	Not explicitly stated	Unspecified	Semi-structured interviews	English. French - France
28	CCU-OHQoL - Critical Care Units Oral Health-related Quality of Life	15	Not explicitly stated.	5* - Satisfaction with oral health, Functional limitations, Self-care, Psychological impact, Xerostomia	Literature review and Panel of experts	English - UK
30	Mijiritsky 2020 - Impact of prosthetic treatments on OHRQoL	31	Not explicitly stated.	6 - Functional disability, Physiological pain, Psychological discomfort, Physiological disability, Psychological disability, Social disability	Questions from the OHIP-49 and PIDAQ	English - Israel

- * FA into the development of the scale for evaluation and/or identification of factors.
- ** Instrument with unclear origin, information obtained from various articles.
- *** Generic instrument for teenagers validated and used as a specific orthodontic instrument in adults.

TABLE S1- Frequency studies according to validation type used and the presence of cross-cultural adaptation.

		Total		Type of Validation				Cross-cultural adaptation			
				External		Internal		Yes		No	
		%	n	%	n	%	n	%	n	%	n
	Total	100,0	392	65,3	256	34,7	136	25,3	99	74,7	293
Validation was the primary objective	yes	77,6	304	63,2	192	36,8	112	31,9	97	68,1	201
	no	22,5	88	72,7	64	27,3	24	2,3	2	97,7	86
Year of publication	1990-2000	6,1	24	58,3	14	41,7	10	8,3	2	91,7	22
	2001-2005	13,0	51	78,4	40	21,6	11	17,7	9	82,4	42
	2006-2010	21,9	86	59,3	51	40,7	35	22,1	19	77,9	67
	2011-2015	32,4	127	71,7	91	28,4	36	25,2	32	74,8	95
	2016-2021	26,5	104	57,7	60	42,3	44	35,6	37	64,4	67
Journals of Publication	Dental Journals	50,8	199	66,3	132	33,7	67	27,1	54	72,9	145
	Dental Public Health	20,7	81	65,4	53	34,6	28	12,4	10	87,7	71
	Non-dental Journals	19,4	76	65,8	50	34,2	26	36,8	28	63,2	48
	Quality of Life	9,2	36	58,3	21	41,7	15	19,4	7	80,6	29
Country	USA, UK, Canada, Ireland	23,0	90	67,8	61	32,2	29	1,1	1	98,9	89
	Other European	18,4	72	59,7	43	40,3	29	38,9	28	61,1	44
	Brazil	8,9	35	57,1	20	42,9	15	20,0	7	80,0	28
	Middle East	8,2	32	56,3	18	43,8	14	43,8	14	56,3	18
	Germany/The Netherlands	7,1	28	75,0	21	25,0	7	17,9	5	82,1	23
	India	5,9	23	82,6	19	17,4	4	39,1	9	60,9	14
	China	4,6	18	44,4	8	55,6	10	44,4	8	55,6	10
	Scandinavian	4,6	18	72,2	13	27,8	5	38,9	7	61,1	11
	Other Asian	4,3	17	76,5	13	23,5	4	41,2	7	58,8	10
	Japan	4,1	16	75,0	12	25,0	4	12,5	2	87,5	14
	Other Latin America	3,6	14	64,3	9	35,7	5	42,9	6	57,1	8
	African Countries	2,8	11	90,9	10	9,1	1	27,3	3	72,7	8
	Australia, New Zealand	2,6	10	60,0	6	40,0	4	0,0	0	100,0	10
Multi countries	2,0	8	37,5	3	62,5	5	25,0	2	75,0	6	
Instrument (measure)	OHIP-14	26,8	105	75,2	79	24,8	26	18,1	19	81,9	86
	OHIP-49	11,7	46	84,8	39	15,2	7	19,6	9	80,4	37
	Other OHIP	12,0	47	59,6	28	40,4	19	19,2	9	80,9	38
	GOHAI-12	14,0	55	49,1	27	50,9	28	34,6	19	65,5	36
	OIDP	9,7	38	79,0	30	21,1	8	26,3	10	73,7	28
	Other Generics	8,4	33	66,7	22	33,3	11	21,2	7	78,8	26
	Condition Specific	17,4	68	45,6	31	54,4	37	38,2	26	61,8	42

FIGURE S1 - Record of the development of the original versions of the existing generic instruments and their relationship with the conceptual model or theoretical background.



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GOHAI	Atchison KA, Dolan TA. Development of the Geriatric Oral Health Assessment Index. <i>J Dent Educ. United States</i> ; 1990;54:680-7.
DIP	Strauss RP, Hunt RJ. Understanding the value of teeth to older adults: influences on the quality of life. <i>J Am Dent Assoc</i> . 1993;124:105-10.
OHIP	Slade GD, Spencer AJ. Development and evaluation of the Oral Health Impact Profile. <i>Community Dent Health</i> . 1994;11:3-11.
SOHSI	Locker D, Miller Y. Evaluation of subjective oral health status indicators. <i>J Public Health Dent</i> . 1994;54:167-76.
DIDL	Leao A, Sheiham A. The development of a socio-dental measure of dental impacts on daily living. <i>Community Dent Health</i> . 1996;13:22-6.
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OES	Larsson P, John MT, Nilner K, Bondemark L, List T. Development of an Orofacial Esthetic Scale in prosthodontic patients. <i>Int J Prosthodont.</i> 2010;23:249–56.
DHEQ	Boiko O V, Baker SR, Gibson BJ, Locker D, Sufi F, Barlow APS, et al. Construction and validation of the quality of life measure for dentine hypersensitivity (DHEQ). <i>J Clin Periodontol.</i> 2010;37:973–80.
PQL	Montero J, Bravo M, Lopez-Valverde A. Development of a specific indicator of the well-being of wearers of removable dentures. <i>Community Dent Oral Epidemiol.</i> 2011;39:515–24.
OHIP-22TMD	Durham J, Steele JG, Wassell RW, Exley C, Meechan JG, Allen PF, et al. Creating a patient-based condition-specific outcome measure for Temporomandibular Disorders (TMDs): Oral Health Impact Profile for TMDs (OHIP-TMDs). <i>J Oral Rehabil.</i> 2011;38:871–83.

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COMDQ	Ni Riordain R, Meaney S, McCreary C. A patient-centered approach to developing a quality-of-life questionnaire for chronic oral mucosal diseases. <i>Oral Surg Oral Med Oral Pathol Oral Radiol Endod.</i> 2011;111:578-586.e2.
HALT	Kizhner V, Xu D, Krespi YP. A new tool measuring oral malodor quality of life. <i>Eur Arch Oto-Rhino-Laryngology.</i> 2011;268:1227-32.
Musurlieva 2012	Musurlieva N, Stoykova M, Boyadjiev D. Validation of a scale assessing the impact of periodontal diseases on patients' quality of life in Bulgaria (pilot research). <i>Braz Dent J.</i> 2012;23:570-4.
OHIP-13-POST	Montero J, Macedo C, Lopez-Valverde A, Bravo M. Validation of the oral health impact profile (OHIP-20sp) for Spanish edentulous patients. <i>Med Oral Patol Oral Cir Bucal.</i> 2012;17:e469-76.
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OHIP-7-ME	Cusson V, Caron C, Gaudreau P, Morais JA, Shatenstein B, Payette H. Assessing Older Adults' Masticatory Efficiency. <i>J Am Geriatr Soc.</i> 2015;63:1192-6.
QoLDAS-9	Perea C, Preciado A, del Rio J, Lynch CD, Celemin A, Castillo-Oyague R. Oral aesthetic-related quality of life of muco-supported prosthesis and implant-retained overdenture wearers assessed by a new, short, specific scale (QoLDAS-9). <i>J Dent.</i> 2015;43:1337-45.
TOQOL	Wright WG, Spiro A, Jones JA, Rich SE, Garcia RI. Development of the Teen Oral Health-Related Quality of Life Instrument. <i>J Public Health Dent.</i> 2017;77:115-24.
	Neely ML, Miller R, Rich SE, Will LA, Wright WG, Jones JA. Effect of malocclusion on adults seeking orthodontic treatment. <i>Am J Orthod Dentofac Orthop.</i> 2017;152:778-87.
OPMDQoL	Tadakamadla J, Kumar S, Laloo R, Johnson NW. Development and validation of a quality-of-life questionnaire for patients with oral potentially malignant disorders. <i>Oral Surg Oral Med Oral Pathol Oral Radiol.</i> 2017;123:338-49.
OHIP-CP	He S, Wang J, Wei S, Ji P. Development and validation of a condition-specific measure for chronic periodontitis: Oral health impact profile for chronic periodontitis. <i>J Clin Periodontol.</i> Blackwell Munksgaard; 2017;44:591-600.
OHIP-14-PD	Rodríguez NI, Moral J. Adaptation and content validity by expert judgment of the oral health impact profile applied to periodontal disease. <i>J Oral Res.</i> 2017;6:92-6.
OHRQoL-OSF	Gondivkar S, Bhowate R, Gadail A, Gaikwad R, Gondivkar R, Sarode S, et al. Development and validation of oral health-related quality of life measure in oral submucous fibrosis. <i>Oral Dis.</i> 2018;24:1020-8.
SCOOHP	Siu-Paredes F, Rude N, Rat C, Reynaud M, Hamad M, Moussa-Badran S, et al. The schizophrenia coping oral health profile. Development and feasibility. <i>Transl Neurosci.</i> 2018;9:78-87.
CCU-OHQoL	Moreno Sancho F, Tsakos G, Brealey D, Boniface D, Needleman I. Development of a tool to assess oral health-related quality of life in patients hospitalised in critical care. <i>Qual life Res.</i> 2020;29:559-68.
Mijiritsky 2020	Mijiritsky E, Lerman Y, Mijiritsky O, Shely A, Meyerson J, Shacham M. Development and validation of a questionnaire evaluating the impact of prosthetic dental treatments on patients' oral health quality of life: A prospective pilot study. <i>Int J Environ Res Public Health.</i> 2020;17:1-19.

TABLE S3 - PRISMA CHECKLIST

Section/topic	#	Checklist item	Reported on page #
TITLE			
Title	1	Identify the report as a systematic review, meta-analysis, or both.	1
ABSTRACT			
Structured summary	2	Provide a structured summary including, as applicable: background; objectives; data sources; study eligibility criteria, participants, and interventions; study appraisal and synthesis methods; results; limitations; conclusions and implications of key findings; systematic review registration number.	2
INTRODUCTION			
Rationale	3	Describe the rationale for the review in the context of what is already known.	4 (par3)
Objectives	4	Provide an explicit statement of questions being addressed with reference to participants, interventions, comparisons, outcomes, and study design (PICOS).	4 (par3)
METHODS			
Protocol and registration	5	Indicate if a review protocol exists, if and where it can be accessed (e.g., Web address), and, if available, provide registration information including registration number.	4 (par5)
Eligibility criteria	6	Specify study characteristics (e.g., PICOS, length of follow-up) and report characteristics (e.g., years considered, language, publication status) used as criteria for eligibility, giving rationale.	4 (par4)
Information sources	7	Describe all information sources (e.g., databases with dates of coverage, contact with study authors to identify additional studies) in the search and date last searched.	4 (par4)
Search	8	Present full electronic search strategy for at least one database, including any limits used, such that it could be repeated.	Appendix 1 and 2
Study selection	9	State the process for selecting studies (i.e., screening, eligibility, included in systematic review, and, if applicable, included in the meta-analysis).	5 (par 2)
Data collection process	10	Describe method of data extraction from reports (e.g., piloted forms, independently, in duplicate) and any processes for obtaining and confirming data from investigators.	5 (par 2, 3)
Data items	11	List and define all variables for which data were sought (e.g., PICOS, funding sources) and any assumptions and simplifications made.	5 (par 2, 3)
Risk of bias in individual studies	12	Describe methods used for assessing risk of bias of individual studies (including specification of whether this was done at the study or outcome level), and how this information is to be used in any data synthesis.	not applicable
Summary measures	13	State the principal summary measures (e.g., risk ratio, difference in means).	not applicable
Synthesis of results	14	Describe the methods of handling data and combining results of studies, if done, including measures of consistency (e.g., I ²) for each meta-analysis.	not applicable

Section/topic	#	Checklist item	Reported on page #
Risk of bias across studies	15	Specify any assessment of risk of bias that may affect the cumulative evidence (e.g., publication bias, selective reporting within studies).	not applicable
Additional analyses	16	Describe methods of additional analyses (e.g., sensitivity or subgroup analyses, meta-regression), if done, indicating which were pre-specified.	not applicable
RESULTS			
Study selection	17	Give numbers of studies screened, assessed for eligibility, and included in the review, with reasons for exclusions at each stage, ideally with a flow diagram.	6 (par 1)
Study characteristics	18	For each study, present characteristics for which data were extracted (e.g., study size, PICOS, follow-up period) and provide the citations.	6 (par 2)
Risk of bias within studies	19	Present data on risk of bias of each study and, if available, any outcome level assessment (see item 12).	not applicable
Results of individual studies	20	For all outcomes considered (benefits or harms), present, for each study: (a) simple summary data for each intervention group (b) effect estimates and confidence intervals, ideally with a forest plot.	not applicable
Synthesis of results	21	Present results of each meta-analysis done, including confidence intervals and measures of consistency.	not applicable
Risk of bias across studies	22	Present results of any assessment of risk of bias across studies (see Item 15).	not applicable
Additional analysis	23	Give results of additional analyses, if done (e.g., sensitivity or subgroup analyses, meta-regression [see Item 16]).	Pag 7 (Table S1)
DISCUSSION			
Summary of evidence	24	Summarize the main findings including the strength of evidence for each main outcome; consider their relevance to key groups (e.g., healthcare providers, users, and policy makers).	Table 1
Limitations	25	Discuss limitations at study and outcome level (e.g., risk of bias), and at review-level (e.g., incomplete retrieval of identified research, reporting bias).	8 (par 3)
Conclusions	26	Provide a general interpretation of the results in the context of other evidence, and implications for future research.	10 (par 3)
FUNDING			
Funding	27	Describe sources of funding for the systematic review and other support (e.g., supply of data); role of funders for the systematic review.	11

APPENDIX 1 - PUBMED SEARCH STRATEGY

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31 "smallii"[Title/Abstract] OR "smalling"[Title/Abstract] OR
32 "smallinterference"[Title/Abstract] OR "smallinterfering"[Title/Abstract] OR
33 "smallintestinal"[Title/Abstract] OR "smallinvasive"[Title/Abstract] OR
34 "smallish"[Title/Abstract] OR "smalli"[Title/Abstract] OR "smallleeches"[Title/Abstract]
35 OR "smaller"[Title/Abstract] OR "smallman"[Title/Abstract] OR
36 "smallminded"[Title/Abstract] OR "smallmolecular"[Title/Abstract] OR
37 "smallmolecule"[Title/Abstract] OR "smallmolecules"[Title/Abstract] OR
38 "smallmouth"[Title/Abstract] OR "smallmtc"[Title/Abstract] OR
39 "smallmtcs"[Title/Abstract] OR "smallmultiple"[Title/Abstract] OR
40 "smallmw"[Title/Abstract] OR "smallnes"[Title/Abstract] OR
41 "smallness"[Title/Abstract] OR "smallness"[Title/Abstract] OR
42 "smallness"[Title/Abstract] OR "smallnessfor"[Title/Abstract] OR
43 "smallnodular"[Title/Abstract] OR "smallnonaggregating"[Title/Abstract] OR
44 "smallnose"[Title/Abstract] OR "smallnow"[Title/Abstract] OR "smallor"[Title/Abstract]
45 OR "smallox"[Title/Abstract] OR "smallpeice"[Title/Abstract] OR
46 "smallpeptide"[Title/Abstract] OR "smallpercentage"[Title/Abstract] OR
47 "smallperturbations"[Title/Abstract] OR "smallpocks"[Title/Abstract] OR
48 "smallpollen"[Title/Abstract] OR "smallport"[Title/Abstract] OR
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3 "smallpos"[Title/Abstract] OR "smallpox"[Title/Abstract] OR "smallpox"[Title/Abstract]
4 OR "smallpoxvaccine"[Title/Abstract] OR "smallpoxvirus"[Title/Abstract] OR
5 "smallpx"[Title/Abstract] OR "smallridge"[Title/Abstract] OR "smallrise"[Title/Abstract]
6 OR "smallrna"[Title/Abstract] OR "smallrnagroup"[Title/Abstract] OR
7 "smallrnas"[Title/Abstract] OR "smallrnaseq"[Title/Abstract] OR
8 "smalls"[Title/Abstract] OR "smallsample"[Title/Abstract] OR
9 "smallsample"[Title/Abstract] OR "smallsats"[Title/Abstract] OR
10 "smallscale"[Title/Abstract] OR "smallscaleinteractions"[Title/Abstract] OR
11 "smallshot"[Title/Abstract] OR "smallsided"[Title/Abstract] OR
12 "smallsize"[Title/Abstract] OR "small-sized"[Title/Abstract] OR
13 "smallsizeodule"[Title/Abstract] OR "smallsoft"[Title/Abstract] OR
14 "smallsome"[Title/Abstract] OR "smallsoon"[Title/Abstract] OR
15 "smallspace"[Title/Abstract] OR "smallspotted"[Title/Abstract] OR
16 "smallstock"[Title/Abstract] OR "smallsubunit"[Title/Abstract] OR
17 "smalltail"[Title/Abstract] OR "smalltalk"[Title/Abstract] OR "smalltalk"[Title/Abstract]
18 OR "smalltasseled"[Title/Abstract] OR "smallthorn"[Title/Abstract] OR
19 "smalltooth"[Title/Abstract] OR "smalltown"[Title/Abstract] OR
20 "smalltrade"[Title/Abstract] OR "smalltually"[Title/Abstract] OR
21 "smallunit"[Title/Abstract] OR "smallventricle"[Title/Abstract] OR
22 "smallvessel"[Title/Abstract] OR "smallvolume"[Title/Abstract] OR
23 "smallware"[Title/Abstract] OR "smallwares"[Title/Abstract] OR
24 "smallwaters"[Title/Abstract] OR "smallwig"[Title/Abstract] OR
25 "smallwood"[Title/Abstract] OR "smallworldness"[Title/Abstract] OR
26 "smally"[Title/Abstract] OR "smallymphocytes"[Title/Abstract]) AND
27 ("real"[Title/Abstract] OR "detectable"[Title/Abstract]) AND ("change"[Title/Abstract]
28 OR "difference"[Title/Abstract])) OR "meaningful change"[Title/Abstract] OR "ceiling
29 effect"[Title/Abstract] OR "floor effect"[Title/Abstract] OR "item response
30 model"[Title/Abstract] OR "irt"[Title/Abstract] OR "rasch"[Title/Abstract] OR
31 "differential item functioning"[Title/Abstract] OR "dif"[Title/Abstract] OR "computer
32 adaptive testing"[Title/Abstract] OR "item bank"[Title/Abstract] OR "cross cultural
33 equivalence"[Title/Abstract]))

APPENDIX 2 - SCOPUS SEARCH STRATEGY

(TITLE-ABS-KEY (aged OR age OR adult OR "Middle aged" OR "of age"))

AND

(TITLE-ABS-KEY ("oral health related quality of life" OR "ohip*" OR "oral health impact profile" OR "oidp*" OR "oral impact on daily performance" OR "oral impact on daily performances" OR "oral impacts on daily performance index" OR "oral impacts on daily performances" OR "gohai*" OR "general oral health assessment index" OR "geriatric oral health assessment" OR "didl" OR "dental impact on daily living" OR "sidd" OR "ohqoluk" OR "dip" OR "pohw" OR "oqlq" OR "miq" OR "fis" OR "family impact scale" OR "qolip 10" OR "quality of life with implant prostheses qolip 10"))

AND

(TITLE-ABS-KEY (instrumentation OR "Validation Studies" OR "reproducibility of results" OR reproducib* OR "psychometrics" OR psychometr* OR clinimetr* OR clinometr* OR "observer variation" OR "discriminant analysis" OR reliab* OR valid* OR coefficient OR "internal consistency" OR (cronbach* AND (alpha OR alphas)) OR "item correlation" OR "item correlations" OR "item selection" OR "item selections" OR "item reduction" OR "item reductions" OR agreement OR precision OR imprecision OR "precise values" OR test-retest OR (test AND retest) OR (reliab* AND (test OR retest)) OR stability OR interrater OR inter-rater OR intrarater OR intra-rater OR intertester OR inter-tester OR intratester OR intra-tester OR interobserver OR inter-observer OR intraobserver OR intra-observer OR intertechnician OR inter-technician OR intratechnician OR intra-technician OR interexaminer OR inter-examiner OR intraexaminer OR intra-examiner OR interassay OR inter-assay OR intraassay OR intra-assay OR interindividual OR inter-individual OR intraindividual OR intra-individual OR interparticipant OR inter-participant OR intraparticipant OR intra-participant OR kappa OR kappa's OR kappas OR "coefficient of variation" OR repeatab* OR ((replicab* OR repeated) AND (measure OR measures OR findings OR result OR results OR test OR tests)) OR generaliza* OR generalisa* OR concordance OR (intraclass AND correlation*) OR

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3 discriminative OR "known group" OR "factor analysis" OR "factor analyses" OR
4 "factor structure" OR "factor structures" OR dimensionality OR subscale* OR
5 "multitrait scaling analysis" OR "multitrait scaling analyses" OR "item discriminant"
6 OR "interscale correlation" OR "interscale correlations" OR ((error OR errors)
7 AND (measure* OR correlat*or AND evaluat*or AND accuracy OR accurate
8 OR precision OR mean) OR "individual variability" OR "interval variability" OR
9 "rate variability" OR "variability analysis") OR (uncertainty AND (measurement
10 OR measuring)) OR "standard error of measurement" OR sensitiv* OR
11 responsive* OR (limit AND detection) OR "minimal detectable concentration"
12 OR interpretab* OR ((small* AND (real OR detectable) AND (change OR
13 difference)) OR "meaningful change" OR "minimal important change" OR
14 "minimal important difference" OR "minimally important change" OR "minimally
15 important difference" OR "minimal detectable change" OR "minimal detectable
16 difference" OR "minimally detectable change" OR "minimally detectable
17 difference" OR "minimal real change" OR "minimal real difference" OR "minimally
18 real change" OR "minimally real difference" OR "ceiling effect" OR "floor effect"
19 OR "Item response model" OR irt OR rasch OR "Differential item functioning"
20 OR dif OR "computer adaptive testing" OR "item bank" OR "cross-cultural
21 equivalence")))
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