Tools to assess the impact of oral health on quality of life in preschool children

Narzędzia do oceny wpływu zdrowia jamy ustnej na jakość życia dzieci w wieku przedszkolnym

Jana Horová[1,2,A-G,K-L] , Iva Brabcová[3,A,E] , Sylva Bártlová[3,A,E] , Věra Hellerová[3,A,D] ,
Milena Mágrová[3,A,D] , Alena Machová[3,A,D] , Hana Lazorová[2,A]

[1]Faculty of Health Care Studies, University of West Bohemia, Czech Republic
[2]University of South Bohemia in České Budějovice, Faculty of Health and Social Sciences, Czech Republic
[3]Faculty of Health and Social Sciences, University of South Bohemia in České Budějovice, Czech Republic

CORRESPONDING AUTHOR:
Jana Horová
Faculty of Health Care Studies, University of West Bohemia, Czech Republic
e-mail: jhorova@kos.zcu.cz

STRESZCZENIE

NARZĘDZIA DO OCENY WPŁYWU ZDROWIA JAMY USTNEJ NA JAKOŚĆ ŻYCIA DZIECI W WIEKU PRZEDSZKOLNYM

Cel pracy. Celem niniejszego artykułu jest identyfikacja obecnie dostępnych narzędzi do oceny wpływu zdrowia jamy ustnej na jakość życia dzieci w wieku przedszkolnym, przedstawienie ich zawartości i właściwości psychometrycznych oraz dostarczenie jak najbardziej aktualnego podsumowania tego zagadnienia - do wykorzystania w praktyce lub dalszych badaniach.

Materiał i metody. Zastosowano metodę przeglądu literatury. Przeszukano bazy danych PubMed, EBSCOhost, CINAHL i ProQuest. Najpierw zidentyfikowano oryginalne kwestionariusze, a następnie wyszukano badania z lat 2018-2023, które przedstawiały adaptację kulturową oryginalnych narzędzi diagnostycznych, w tym ich właściwości psychometryczne.

Wyniki. Zidentyfikowano osiemnaście badań przedstawiających wyniki adaptacji kulturowych ośmiu rodzimych narzędzi. Narzędzia różniły się liczbą pytań i ich treścią. Najbardziej preferowanym narzędziem do oceny wpływu zdrowia jamy ustnej na jakość życia dzieci w wieku przedszkolnym okazała się Skala Wpływu Zdrowia Jamy Ustnej We Wczesnym Dzieciństwie (ang. Early Childhood Oral Health Impact Scale), która ma również doskonałe właściwości psychometryczne.

Wnioski. Niniejszy artykuł zawiera aktualny przegląd dostępnych narzędzi do oceny jakości życia dzieci w wieku przedszkolnym w kontekście zdrowia ich jamy ustnej, w tym treści i właściwości psychometrycznych tych narzędzi, co umożliwia wybór odpowiedniego narzędzia do zastosowania w praktyce.

Słowa kluczowe: jakość życia, zdrowie jamy ustnej, przedszkolak, narzędzie

ABSTRACT

TOOLS TO ASSESS THE IMPACT OF ORAL HEALTH ON QUALITY OF LIFE IN PRESCHOOL CHILDREN

Aim. This article aims to identify currently available instruments for assessing the impact of oral health on quality of life in preschool-aged children, to present their content and psychometric properties, and to provide the most up-to-date summary of the topic for use in practice or further research.

Material and methods. The method of literature review was chosen. PubMed, EBSCOhost, CINAHL, and ProQuest databases were searched. First, original questionnaires were identified and then studies from 2018 to 2023 that presented cultural adaptation of the original instruments including their psychometric properties were retrieved.

Results. Eighteen studies reporting the results of cultural adaptations of eight indigenous instruments were identified. The instruments differ in the number of questions and their content. The most preferred instrument for assessing the impact of oral health on the quality of life in preschool children is the Early Childhood Oral Health Impact Scale, which also has excellent psychometric properties.

Conclusions. This article provides an up-to-date overview of the available tools for assessing the quality of life of preschool children in the context of their oral health, including content and psychometric properties, thus allowing the selection of a relevant tool for use in practice.

Key words: quality of life, oral health, preschooler, tool

PRACE POGLĄDOWE Review Papers

INTRODUCTION

Oral diseases affect almost half of the world's population (45 %) throughout their lifetime, from early life to old age [1]. Oral health-related quality of life (OHRQoL) is defined as an assessment of well-being and satisfaction with current oral health status and its psychosocial consequences. It is a multidimensional construct that encompasses the subjective self-perception of the impact of oral health on an individual's functional and emotional well-being, as well as on the expectations they have and satisfaction with care [2].

The concept of OHRQoL began to evolve in the late 1970s based on increasing evidence of the impact of oral disease on the individual's physical and psychological status and social roles [3].

Oral disease as early as childhood can have serious lifelong consequences. Children and adolescents can be affected by numerous disorders that impact their functional, social and psychological well-being. Untreated early childhood dental caries or other dental disorders can result in pain, impaired nutrition and growth, delayed speech development, and secondarily can cause learning disabilities or social isolation [4]. Assessing the impact of oral health on the quality of life of children and their loved ones can improve collaboration and communication between health professionals, the child and parents, and influence the future care and life of the child [5].

Specific challenges may arise when measuring OHRQoL in young children due to the stage of physical, cognitive, emotional, social and language development, and because oral health and health cognition correlate with age. Thus, limited communication and cognitive abilities in preschool children require a specific approach. Therefore, the quality of life of preschool children is measured in collaboration with parents or other representatives to avoid underestimation of children's oral health problems and to obtain representative data on children's health status [6]. Although parents' proxy statements about children's quality of life are sometimes questioned [7], caregivers play a crucial role in the prevention and health of children, and a child's long-term illness can affect them as well. In childhood, it is important to assess the impact of oral health on both the child and the family [8].

In many areas of health, quality of life assessment tools are specifically created and developed comprehensively for children and adolescents. In recent years, a number of tools have been developed to assess quality of life in school-aged children and adolescents in relation to their oral health [9, 10]. For preschool children, for whom oral health assessment is important in the context of quality of life, there is no up-to-date overview. Therefore, our study is concerned with mapping instruments that assess the impact of oral health on quality of life in preschool children and their psychometric properties. The original instruments and their cultural adaptations from the past five years are presented.

AIM

The aim of the systematic review is
a) identify currently available tools for assessing the impact of oral health on the quality of life of preschool children
b) summarise their content and psychometric properties.

MATERIALS AND METHODS

A systematic review design was chosen. Keywords were determined based on the research question. These were formulated using a modified PICo tool structure: Participant; Phenomena of Interest and Context [11].

What assessment tools assess quality of life (I) in preschool children (P) in the context of oral health (Co)? Keywords

A search strategy using Boolean operators and truncation was used (Fig. 1).

What assessment tools (I) assess quality of life in the context of oral health (Co) in preschool children (P)?		
1	preschooler* OR early childhood OR toddler*	P
2	tool* OR instrument* OR scale* OR questionnaire*	I
3	oral health-related quality of life OR oral health	Co
4	1 AND 2 AND 3	PICo

Fig 1. Key words and search strategy using PICo questions

A systematic search of studies was conducted to identify and locate relevant sources. PubMed, EBSCOhost, CINAHL and ProQuest databases were searched at all stages of the research. The aim of the first phase of the search was to find all available original tools for assessing oral health in the context of quality of life in preschool children, with the intention of presenting the reader with a comprehensive view of the subject. In the first phase, the search period of the last thirty years (1993 to 2023) was chosen. The second phase of the search then focused on studies that represented cultural adaptations of the original instruments retrieved in the first phase, and that presented the psychometric properties of the adapted instruments. We focused on studies published from 2018 to 2023. The time period of the last five years was chosen in an attempt to present the current research activities. Included are studies that reported psychometric properties related to instrument development and validation (internal consistency, reliability, and validity). The second phase of our research followed a review study published in 2021 [12], which presented a review and comparison of original instruments retrieved up to 2019.

These characteristics were assessed and are presented with respect to the COnsensus-based Standards for the selection of health Measurement INstruments (COSMIN) guidance for completing systematic reviews of patient-reported outcome measures [13].

Non-text sources, case report or series studies, systematic review, meta-analysis, if the tool was used in a randomized trial or pilot study, and studies focusing on school-aged children were excluded. Only studies in English were included. The overall search strategy is illustrated in the PRISMA flow diagram. (Fig. 2).

■ Tab. 1. Characteristics of the group of respondents in terms of a year of starting the studies and their profession

Instrument	Author /Year of publication	Country, area /language	Age of children	Number of children	Number of domains /items
Dental Discomfort Questionnaire (DDQ)	Versloot et al./2006 [14]	Netherlands/English	30-59 months	146*	12 items
P-DDQ	Behbahanirad et al./2022 [15]	Irán (Persian version)	25-60 months	60*	12 items
Early Childhood Oral Health Impact Scale (ECOHIS)	Pahel et al./2007 [16]	USA/English	3-5 years	295*	2 sections/13 items
NAIJA ECOHIS	Nzomiwu et al./2018 [17]	Nigeria/Nigerian Pidgin English	2-5 years	104*	2 sections/13 items
ECOHIS	Zaror et al./2018 [18]	Chile/Chilean Spanish	2-5 years	302*	2 sections/13 items
ECOHIS	Ghanghas et al./2019 [19]	India/Hindi	3-5 years	469*	2 sections/13 items
ECOHIS-G	Bekes et al./2019 [20]	Germany/German	0-5 years	241*	2 sections/13 items
Malagasy-ECOHIS	Randrianarivony et al./2020 [21]	Malagasy/Malagasy	3-5 years	150*	2 sections/13 items
ECOHIS	Sheen et al./2020 [22]	Taiwan/Taiwanese Mandarin	3-6 years	251*	2 sections/13 items
M-ECOHIS	Montoya et al./2021 [23]	Mexico/Spanish	3-5 years	303*	2 sections/13 items
Th-ECOHIS	Leelataweewud et al./2021 [24]	Thailand/Thai	36-48 months	214*	2 sections/13 items
ECOHIS-SVN	Likar Ostrc et al./2023 [25]	Slovenia/Slovenian	under 6 years	255*	2 sections/13 items
S-ECOHIS	Sabel et al./2023 [26]	Sweden/Swedish	2-5 years	274*	2 sections/13 items
The PedsQL™ Oral Health Scale™	Steel et al./2009 [27]	USA/English	2-18 years (part for toddlers 2-4 years)	126 (1st phase) 34 (2nd phase)	2 sections/23 items (21pre-school version)
PedsQL	Atala-Acevedo et al./2020 [28]	Chile/Spanish	2-5 years	301*	2 sections/21 items
Pediatric Oral health-related Quality of Life (POQL)	Huntington et al./2011 [29]	USA/English	2-16 years	3400 (218*pre-school children)	2 sections/ 10 items (6 items for pre-school version)
Scale of Oral Health Outcomes (SOHO-5)	Tsakos et al./2012 [30]	UK/English	5-year-olds	296	2 sections/7 items
C-SOHO-5	Gao et al./2020 [31]	China/Chinese	5-year-olds	279	2 sections/7 items+ two global rating questions
Oral Health related Early Childhood Quality of Life (OH-ECQoL)	Mathur et al./2013 [32]	India/Hindi, English	24-71 months	300*	2 sections/18 items
Manipuri OH ECQoL	Dharmani et al./2019 [33]	India/Manipuri	24-71 months	300*	2 sections/18 items
Nepali version of OH-ECQoL	Upadhyay et al./2021 [34]	Nepal/Nepali	24-71 months	91*	2 sections/18 items
Malayalam version of the OH ECQoL	Peedikayil et al./2022 [35]	India/Malayalam	24-71 months	300*	2 sections/18 items
Child Oral Health Impact Profile-preschool version (COHIP-PS)	Ruff et al./2017 [36]	USA/English	2-5 years	327*	4 domains/11 items
eCOHIP-PS/C	He et Wang/2020 [37]	China (electronic version)	2-5 years	260*	4 domains/10 items
Malocclusion Impact Scale for Early Childhood (MIS-EC)	Homem et al./2023 [38]	Brazil/Brazilian Portugues,English	3-5 years	381*	2 sections/8 items + two general questions
MIS-EC/C	Chen/2023 [39]	China/Chinese	3-5 years	210*	2 sections/8 items + two general questions

*questionnaire completed by parents or caregivers
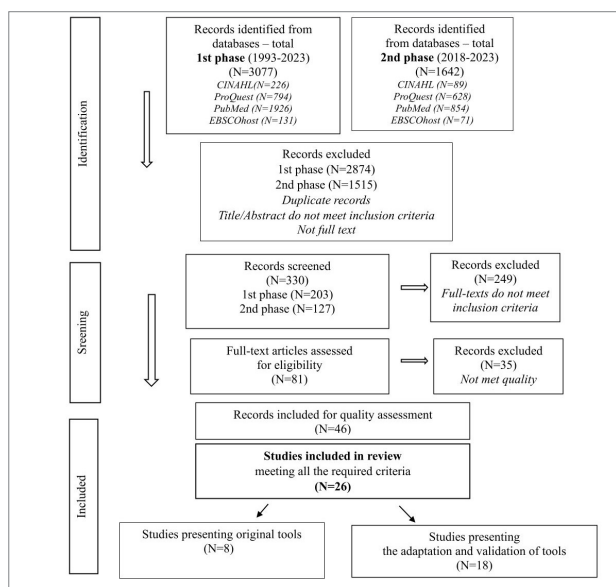
■ Fig 2. PRISMA flow diagam, N-total number

RESULTS

Characteristics of included instruments

Over the past 30 years, eight original instruments have been developed to assess the oral health of preschoolers in the context of quality of life [14, 16, 27, 29, 30, 32, 36, 38]. These tools have undergone cultural adaptations, with 18 cultural adaptations identified in the last five years (Tab. 1). The domains that the instruments assessed (Tab. 2) were administered by the parent or caregivers. The sample sizes of children examined in each study ranged from 60 children [15] to 469 [19] aged under 6 years. The adaptation of the measurement tools into a foreign language was carried out according to standards, mostly by back-translation, expert review and pre-test. The structure and content of the instruments vary. They contain from 7 to 23 different items and assess 2-8 dimensions/factors (Oral health,

Functional well-being, Social-Emotional well-being, Self-Image, Child psychology, Parenteral distres, Family function, School functionig, Role functioning) (Tab. 2). The most commonly reported dimensions are Functional well-being and Social-Emotional well-being. Oral health or Self-image were other dimensions reported. Most tools are divided into two parts, the first part assessing the impact on the child and the second part focusing on the parent/family. The most commonly used tool to assess the impact of oral health on the quality of life in preschool children is the Early Childhood Oral Health Impact Scale (ECOHIS) [16]. This questionnaire also includes most domains of assessment, along with the Malocclusion Impact Scale for Early Childhood (MIS-EC) [38]. Cultural adaptation was not observed for the Pediatric Oral health-related Quality of Life (POQL) questionnaire, [29] during the specified period.

Development and description of the analyzed measuring tools

The development of the instruments/questionnaires/scales, their content and any changes that occurred during the adaptation of the questionnaire in the new cultural environment are important for their use. The psychometric properties of the questionnaires from the included studies are presented in Tab. 3.

Presentation of original instruments

Dental Discomfort Questionnaire (DDQ)

The Dental Discomfort Questionnaire (DDQ) was developed in the Netherlands in 2006 to assess dental discomfort in very young children [14]. The questionnaire can help to detect behaviours indicative of dental pain. The original 12-item questionnaire measures one dimension in two parts (Occurrence of toothache and Behaviours possibly associated with toothache or discomfort). The four items of the questionnaire do not correlate with the occurrence of pain and tooth decay, so a version of the DDQ-8 was also developed.

Early Childhood Oral Health Impact Scale (ECOHIS)

In the United States of America (North Carolina), the Early Childhood Oral Health Impact Scale (ECOHIS) was developed and validated in 2007 [16]. ECOHIS contains two main parts, the part on the impact on the child and the part on the impact on the child. The child-focused section consists of questions about the child's symptoms, the child's role, the child's psyche, the child's self-concept, and social interaction. The family impact section assesses two areas: parental distress and family functioning.

The PedsQL™ Oral Health Scale™

The PedsQL™ Oral Health Scale™ was developed in the USA in 2009 as a general measure of OHRQoL in children [27]. The pre-school version, which is answered by parents and/or guardians, consists of 21 items divided into four subscales: physical functioning (eight items), emotional functioning (five items), social functioning (five items) and school functioning (three items).

Pediatric Oral health-related Quality of Life (POQL)

In 2011, a quality of life questionnaire related to oral health in children was developed in the USA [29]. It is a measure for use with preschool, school-age and younger school-age children. The POQL best captured four dimensions: physical functioning, role functioning, social functioning, and emotional functioning. This tool places special emphasis on the experiences and views of preschool children from low-income and minority populations.

Scale of Oral Health Outcomes (SOHO-5)

An oral health outcome scale for five-year-olds (SOHO-5) was developed in the United Kingdom in 2011 [30]. This is a questionnaire that is used to measure preschool children's OHRQoL as reported by the child (SOHO-5c) and parents (SOHO-5p). The SOHO-5 questionnaire contains seven items and assesses how the child eats, drinks, talks, plays and sleeps in relation to the condition of their teeth, and whether he/she avoids smiling because of pain or appearance.

Oral Health related Early Childhood Quality of Life (OH-ECQoL)

Early Childhood Oral Health Related Quality of Life (OH-ECQoL) was developed in India in 2013 [32]. This instrument consists of 16 items including a child impact section (symptoms, function, emotional and social well-being) and a family impact section. In addition, it contains a fifth domain related to system well-being (two items of the questionnaire).

Child Oral Health Impact Profile – Preschool version (COHIP-PS)

The Child Oral Health Impact Profile - Preschool version (COHIP-PS) was created from the original COHIP tool that is used to assess OHRQoL in school-aged children. The COHIP-PS was originally developed in the USA in 2017 [36] and comprises ten items and four domains (oral health, functional well-being, social-emotional well-being and self-image). The COHIP-PS is a validated measure of OHRQoL for preschool children with orofacial conditions, speech and language deficits, dental needs, and healthy community participants. This questionnaire was adapted into an electronic version in China in 2019 [37].

Malocclusion Impact Scale for Early Childhood (MIS-EC)

The Malocclusion Impact Scale for Early Childhood (MIS-EC) is a scale specific for assessing the impact of malocclusion on oral health-related quality of life in children aged 3-5 years and the quality of life of their parents/caregivers. This scale was developed and validated in 2021 in Brazil [38]. The final version of the MIS-EC contains eight items: six questions in the child impact section and two in the family impact section. The child impact section is divided into three areas (functional impact, psychological impact and social interaction/self-impact) and the impact section is divided into two areas (parent distress and financial impact).

■ Tab. 2. Dimensions of tools

Dimensions	DDQ-8	ECOHIS	PedsQL	POQL	SOHO-5	OH-ECQoL	COHIP-PS	MIS-EC
Oral Health	✓	✓	✓			✓	✓	✓
Functional well-being	✓	✓	✓	✓	✓	✓	✓	✓
Social-Emotional well-being	✓	✓	✓	✓		✓	✓	✓
Self-Image	✓			✓			✓	✓
Child psychology		✓						✓
Parenteral distress		✓				✓		✓
Family function		✓				✓		✓
School functioning		✓	✓			✓		✓
Role functioning				✓				

Selecting the best tool for a given area of interest requires high-quality studies that document the evaluation of measurement properties, both in terms of quality and in terms of the effectiveness of the relevant outcome measures. When assessing the quality of a questionnaire/scale/instrument, its validity and reliability are evaluated. Measurement properties presented (including the original instruments) included construct validity (how well the test measures the construct it was designed to assess; it was evaluated for

■ Tab. 3 . Psychometric properties of instruments

Tool	Authors	Internal consistency Cronbach's alpha-total	Validity					Reliability/ overall
			Construct,-discriminant	Convergent	Content	Structural	Concurent	
DDQ	Versloot et al. [14]	0.74	✓					Cronbach's alpha 0.74
	Behbahanirad et al./2022 [15]	0.769	✓	✓		✓		weighted kappa >0.60 (except two items)
ECOHIC	Pahel et al. [16]	0.91−0.95	✓	✓				ICC 0.84
	Nzomiwu et al. [17]	0.86	✓	✓				ICC 0.97
	Zaror et al. [18]	0.89	✓	✓				ICC 0.84
	Ghanghas et.al [19]	0.873	✓	✓				ICC 0.91
	Bekes et al. [20]	0.83	✓	✓				ICC 0.81
	Randrianarivony et al. [21]	0.847	✓	✓	✓		✓	ICC 0.889
	Sheen et al. [22]	0.76	✓	✓				multiple linear regression, dmft 0.42
	Montoya et al. [23]	0.85	✓	✓				ICC 0.95
	Leelataweewud et al. [24]	0.854	✓	✓	✓			ICC 0.87
	Likar Ostrc et al. [25]	0.85	✓	✓			✓	ICC 0.85
	Sabel et al. [26]	0.84	✓	✓			✓	ICC 0.95
The PedsQL™ Oral Health Scale™	Steel et al. [27]	0.86 child; .92 parent	✓	✓			✓	ICC 0.49
	Atala-Acevedo et al. [28]	0.87	✓	✓		✓		ICC 0.85
Pediatric Oral health-related	Huntington et al. [29]	0.83	✓	✓		✓		ICC 0.75
Scale of Oral Health Outcomes (SOHO-5)	Tsakos et al. [30]	0.84	✓		✓			ICC 0.29
	Gao et al. [31]	0.71 child; 0.82 parents	✓					ICC 0.85 child 0.46 parents
Oral Health related Early Childhood Quality of Life (OH-ECQoL)	Mathur et al. [32]	0.862	✓	✓			✓	ICC 0.9414
	Dharmani et al. [33]	0.836	✓	✓			✓	ICC 0.94
	Upadhyay et al. [34]	0.891	✓				✓	ICC 0.963
	Peedikayil et al. [35]	0.94	✓				✓	ICC 0.876
COHIP-PS	Ruff et al. [36]	0.78	✓	✓	✓	✓		ICC 0.87
	He et Wang [37]	0.903		✓	✓	✓		ICC 0.862
Malocclusion Impact Scale for Early Childhood (MIS-EC)	Homem et al. [38]	0.79	✓	✓				ICC 0.94
	Chen [39]	0.943	✓	✓		✓		ICC 0.873

ICC-Intraclass correlation coefficient

all instruments), content validity (how well the instrument covers all relevant parts of the construct it was designed to measure; including face validity; evaluated in studies 21, 24, 30, 36, and 37), convergent validity (refers to how closely the test is related to other tests that measure the same or similar constructs; studies 15-29, 32, 33), structural validity (the dimensional structure of the instrument; studies 15, 28, 29, 36, 37, 39), and concurrent validity (measures tests and criterion variables simultaneously; studies 21, 25, 26, 27, 32, 33, 34, 35).

Internal consistency (Total score), as expressed by Cronbach's alpha, ranged from 0.74 [14] to 0.95 [16] for each questionnaire. The highest values of the internal consistency coefficient (more than 0.90) were found for the ECOHIC tool adaptation [16], PedsQL [27], OH-ECQoL [35], COHIP-PS [37] and MIS-EC [38]. Table 3. summarizes information about the presented tool properties, including the types of validities reported. Reliability was presented in accordance with the COSMIN recommendation [13]. This guideline prefers to use intraclass correlation coefficient (ICC) or weighted Cohen's kappa to assess reliability. The reliability of instruments was almost always reported as ICC by the study authors, with only one case presented as weighted kappa [15].

DISCUSSION

The aim of the review was to identify currently available tools for assessing the impact of oral disease on the quality of life of preschool children and to summarize their content and psychometric properties. The most preferred tool for cultural adaptation is the ECOHIS instrument, which has excellent psychometric properties. The authors of the original instrument state that the validity of the questionnaire was established through parents of five-year-old children only and therefore needs to be verified with parents of children younger than five years [16]. Subsequent adaptations and validations of this tool have been conducted on younger children, and results have demonstrated its excellent properties in other cultural settings [17-26]. Some authors [40] debate whether questionnaires of this type can truly capture aspects of quality of life and suggest that this dimension should be reported as a subjective measure of health status. However, for preschool children, quality of life is measured by caregivers. The proxy statements may not always accurately reflect the reality experienced by the child [6], for example, in the case of some of the instruments presented, the dimensions of Self-image or Child psychology may be involved. However, a preschooler's perception of self may be most relevant to the caregiver/parents, so these dimensions are also included in the quality of life assessment to make it comprehensive and holistic.

All eight original instruments presented [14, 16, 27, 29, 30, 32, 36, 38] show very good to excellent psychometric properties. Nevertheless, some recommendations should be mentioned. For example, that researchers should base the quality of structural validity on the quality of the instrument and should assess this property of the instrument, for example, using a two-factor confirmatory factor analysis (CFA) score [13]. CFA results can be affected by factors such as the hypothesis being tested, measurement instruments, multivariate normality, parameter identification, outliers or missing data. A requirement for a sufficient sample size is also given, e.g., 5-20 cases per parameter estimate or it is recommended that the research sample should be at least 200, which was not met by some included studies in our review [15, 34]. In terms of reliability, the intercorrelation coefficient (ICC) is the most appropriate and commonly used reliability parameter for continuous measurements. For ordinal scales, partial random agreement must be taken into account, and therefore weighted kappa is preferred, which is most often used to assess the agreement between two raters when classifying subjects into several groups. The use of Pearson's and Spearman's correlation coefficients is considered questionable because these correlations do not account for systematic error [13]. A positive confidence rating is when the ICC or weighted kappa is at least 0.70 in a sample of at least 50 patients. Reliability was expressed by ICC for the included studies. An assessment of the quality of the individual psychometric properties of the instruments presented has not been conducted; however, the growing interest in quality cultural adaptation and validation of population health instruments has led to the psychometric properties of questionnaire scales being evaluated and discussed by experts. The aim of the authors of the article was to provide an up-to-date overview of available tools for assessing the quality of life of preschool children in the context of their oral health. Among the limitations that may have affected the presented review, it should be noted that only cultural adaptations of studies published in English between 2018 and 2023 were assessed. Additional tools may have been validated during 2024. Thus, some cultural adaptations may not have been identified and included in the review.

CONCLUSIONS

Thorough testing of measurement tools as part of their adaptation to different cultural and social environments is essential. The overview presents eight original instruments that have been adapted and translated into a number of languages. The presented results allow orientation in current assessment tools for preschool children and selection of the appropriate tool for use in practice. The overview also provides inspiration for other cultural adaptations and for their comparison. It is important that valid and reliable questionnaires are available to practitioners, for use in research, to provide relevant information, and that the results help the development of health services.

■ ORCID

Jana Horová https://orcid.org/0000-0001-9594-6066
Iva Brabcová https://orcid.org/0000-0002-8707-8091
Sylva Bártlová https://orcid.org/0000-0003-0328-0725
Věra Hellerová https://orcid.org/0000-0001-8409-585X
Milena Mágrová https://orcid.org/0000-0001-8392-6762
Alena Machová https://orcid.org/0000-0001-6506-3588
Hana Lazorová https://orcid.org/0009-0009-8319-3760

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