CROSS-CULTURAL ADAPTATION AND VALIDATION OF THE ARABIC VERSION OF SOHO-5 AND ITS USE TO ASSESS ORAL IMPACT ON QUALITY OF LIFE IN 5-YEAR-OLD CHILDREN

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by

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LIST OF ABBREVIATIONS

SOHO	Scale of Oral Health Outcomes for 5-year-Old Children
A-SOHO-5	Arabic SOHO-5
E-SOHO-5	English SOHO-5
SES	Socioeconomic status
IQOLA	International Quality of Life Association
HRQoL	Health-Related Quality of Life
QoL	Quality of Life
OHRQoL	Oral Health-Related Quality of Life
ECOHIS	Early Childhood Oral Health Impact Scale
A-ECOHIS	Arabic Version of the Early Childhood Oral Health Impact Scale
ECC	Early Childhood Caries
S-ECC	Severe Early Childhood Caries
D	Decayed
M	Missing
F	Filled
T	Teeth
DMFT	Decayed, Missing, and Filled permanent Teeth Index
d	decayed
m	missing
f	filled
t	teeth
dmft	decay, missing, filled primary teeth index

OH-ECQOL	Oral Health-Related Early Childhood Quality of Life
Michigan-OHRQOL	Michigan Oral Health-Related Quality of Life
UAE	The United Arab Emirates
CCA	Cross-Cultural Adaptation
WHO	World Health Organisation
USM	Universiti Sains Malaysia
ESE	Emirates Schools Establishment
PIC	Principal in Charge
MOE	Ministry of Education
SES	Socioeconomic Status
CI	Confidence Interval
ICC	Intraclass Correlation Coefficient
CFGs	Consultation Focus Groups
NHSGGC	Greater Glasgow and Clyde National Health Service
NDIP	National Dental Inspection Programme
DepCat index	Deprivation Category Index
BASCD	British Association for the Study of Community Dentistry
EMPRO	Evaluating Measure of Patient Related Outcome
NIH	National Institutes of Health
NIDCR	National Institute of Dental and Craniofacial Research
AHRQ	Agency for Healthcare Research and Quality
DPBRNs	Dental Practice Based Research Networks
PEARL	Practitioners Engaged in Applied Research and Learning
DDQ	Dental Discomfort Questionnaire
UNICEF	United Nations International Children's Emergency Fund

EU	European Union
YLD	Years Lived with Disability
ICDAS	International Caries Detection and Assessment System
SiC	Significant Caries Index
RR	Relative Risk
CIS	Child Impact Section
FIS	Family Impact Section
USA	United States of America
HR-PRO	Health Related Patient Related Outcome
TDI	Traumatic Dental Injuries
SF-36	36-Item Short Form Health Survey
UNGA	United Nations General Assembly
UK	United Kingdom
UN	United Nations
PRECEDE	Predisposing, Reinforcing, and Enabling Factors model
WHOQOL	World Health Organization Quality of Life
NOPLAS	Nutrition, Oral Health, Physical Development, Lifestyle, Anthropometry and Socioeconomic Status
GCC	Gulf Cooperation Council
GOHAI	Geriatric Oral Health Assessment Index
COHIP-SF	Child Oral Health Impact Profile-Short Form

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ADAPTASI RENTAS BUDAYA DAN PENGESAHAN SOHO-5 VERSI BAHASA ARAB UNTUK MENILAI IMPAK ORAL TERHADAP KUALITI KEHIDUPAN KANAK-KANAK BERUMUR 5 TAHUN

ABSTRAK

Kesihatan mulut yang buruk boleh menjejaskan fungsi harian kanak-kanak secara signifikan, termasuk dalam aspek makan, bercakap, bermain dan harga diri. Oleh itu, pengukuran kualiti hidup berkaitan kesihatan mulut (OHRQoL) dalam kalangan kanak-kanak prasekolah adalah penting untuk memahami dan menangani kesan ini. Objektif kajian ini adalah untuk (1) menterjemah versi asal Bahasa Inggeris bagi Skala Hasil Kesihatan Mulut untuk kanak-kanak berumur 5 tahun (SOHO-5) ke dalam Bahasa Arab, dan mengesahkan kesahihan versi Bahasa Arab tersebut (A-SOHO-5), dan (2) menilai kesan keadaan pergigian terhadap OHRQoL dalam kalangan kanak-kanak prasekolah berbahasa Arab di Emiriah Arab Bersatu (UAE). Kajian ini dijalankan dalam dua peringkat. Peringkat I melibatkan penyesuaian silang budaya (CCA) dan penilaian psikometrik A-SOHO-5. Proses penterjemahan telah mengguna pakai dan mengubah suai garis panduan Beaton, dan pra-uji telah dijalankan melibatkan 32 pasangan kanak-kanak–ibu bapa. Sampel berasingan melibatkan 157 pasangan anak-ibu bapa telah direkrut dari tadika Kerajaan untuk penilaian psikometrik. Kanak-kanak menjalani temu bual berstruktur dalam Bahasa Arab, manakala ibu bapa melengkapkan soal selidik yang dijawab sendiri. Pemeriksaan pergigian klinikal dijalankan mengikut kriteria WHO. Penilaian psikometrik merangkumi konsistensi dalaman, kebolehpercayaan uji semula (n = 30), dan pengesahan kesahihan (diskriminan, konvergen dan konstruk). Peringkat II merupakan satu kajian keratan lintang yang telah menilai hubungan antara keadaan kesihatan

mulut dan OHRQoL, dengan menggunakan pensampelan berkelompok yang melibatkan 372 pasangan anak–ibu bapa daripada sebuah sekolah kerajaan dan lima buah sekolah swasta di Sharjah dan Ajman. Pemeriksaan klinikal serta temu bual/soal selidik berstruktur dijalankan seperti dalam Peringkat I. Keputusan menunjukkan konsistensi dalaman yang tinggi bagi versi ibu bapa (α Cronbach = 0.89) dan sederhana bagi versi kanak-kanak (α = 0.68). Kebolehpercayaan uji semula adalah sangat tinggi (α Cronbach = 0.97 untuk kanak-kanak, 0.98 untuk ibu bapa; julat ICC: 0.77–1.00). Kesahihan diskriminan disokong melalui skor purata A-SOHO-5 yang jauh lebih tinggi dalam kalangan kanak-kanak yang mengalami karies (kanak-kanak: 1.72; ibu bapa: 2.38) berbanding rakan sebaya tanpa karies (kanak-kanak: 0.02; ibu bapa: 0.39). Kesahihan konvergen dibuktikan melalui korelasi yang kuat antara skor fungsi A-SOHO-5 versi ibu bapa dan A-ECOHIS ($r = 0.72$, $p < 0.001$). Kesahan konstruk disahkan menggunakan A-SOHO-5 dan soalan penarafan global. Korelasi sederhana antara skor A-SOHO-5 kanak-kanak dan ibu bapa ($r = 0.42$, $p < 0.001$) menyokong kesepakatan laporan. Kanak-kanak yang mengalami karies menunjukkan OHRQoL yang jauh lebih rendah. Analisis regresi multivariat mengenal pasti status klinikal, tahap pendidikan ibu bapa, dan jenis sekolah sebagai peramal signifikan terhadap kemerosotan OHRQoL ($p < 0.05$). Penemuan ini mengesahkan bahawa A-SOHO-5 merupakan instrumen yang sah dan boleh dipercayai untuk menilai OHRQoL dalam kalangan kanak-kanak prasekolah berbahasa Arab. Kajian ini menekankan impak ketara keadaan kesihatan mulut terhadap kesejahteraan kanak-kanak dan kepentingan strategi pencegahan yang disasarkan merentas populasi yang pelbagai di UAE.

CROSS-CULTURAL ADAPTATION AND VALIDATION OF THE ARABIC VERSION OF SOHO-5 AND ITS USE TO ASSESS ORAL IMPACT ON QUALITY OF LIFE IN 5-YEAR-OLD CHILDREN

ABSTRACT

Poor oral health can significantly impair young children's daily functioning, affecting eating, speaking, playing, and self-esteem. Consequently, measuring oral health-related quality of life (OHRQoL) in preschoolers is essential to understand and address these impacts. The study objectives were to (1) translate the original English version of the Scale of Oral Health Outcomes for 5-year-old children (SOHO-5) into Arabic, and validate the Arabic version (A-SOHO-5), and (2) assess the impact of dental conditions on the OHRQoL of Arabic-speaking preschoolers in the United Arab Emirates (UAE). The study was conducted in two stages. Stage I involved cross-cultural adaptation (CCA) and psychometric assessment of A-SOHO-5. The translation process adopted and modified the guideline of Beaton, and pre-testing was conducted among 32 child-parent pairs. A separate sample of 157 child-parent pairs was recruited from government preschools for the psychometric assessment. Children participated in structured Arabic interviews, while parents completed self-administered questionnaires. Clinical dental examinations were conducted following WHO criteria. Psychometric evaluation included internal consistency, test–retest reliability (n=30), and validity testing (discriminant, convergent, and construct). Stage II was cross-sectional study assessed the association between oral health conditions and OHRQoL using a cluster sample of 372 child-parent pairs from one government and five private schools in Sharjah and Ajman. Clinical examinations and structured interviews/questionnaires were conducted as in Stage I. Results demonstrated strong

internal consistency for the parent version (Cronbach's alpha = 0.89) and moderate for the child version ($\alpha = 0.68$). Test–retest reliability was excellent (Cronbach's alpha = 0.97 for child, 0.98 for parent; ICC range: 0.77–1.00). Discriminant validity was confirmed by significantly higher A-SOHO-5 mean scores in caries-experienced children (child 1.72; parent 2.38) than in caries-free peers (child 0.02; parent 0.39). Convergent validity was demonstrated by a strong correlation between A-SOHO-5 (parent version) and A-ECOHIS functional scores ($r = 0.72$, $p < 0.001$). Construct validity confirmed using A-SOHO-5 and global rating questions. A moderate correlation between child and parent A-SOHO-5 scores ($r = 0.42$, $p < 0.001$) supported the agreement. Children with dental caries had significantly poorer OHRQoL. Multivariable regression identified clinical status, parental education, and school type as significant predictors of impaired OHRQoL ($p < 0.05$). The findings confirm that the A-SOHO-5 is a valid and reliable instrument for assessing OHRQoL in Arabic-speaking preschoolers. This study highlights the substantial impact of oral conditions on children's well-being and emphasises the importance of targeted preventive strategies across diverse populations in the UAE.

CHAPTER 1

INTRODUCTION

1.1 Background of The Study

Children are defined as those aged below 18 years old (United Nations, 1989) who bear the right as a person as declared by the United Nations General Assembly (UNGA) (1959) (United Nations [accessed 23 Sept 2024]). According to the age group, the global population of children aged five and below reached 647.34 million in 2024. In the United Arab Emirates (UAE), the number of children in this age group was estimated to be 581,196 in 2024 (Our World in Data [accessed 23 Sept 2024]). Most of these children stay with their parents or caregivers. Children lack awareness and life experience, leading to making the right decisions in their daily lives difficult. As a result, they rely on the guidance of the elderly, especially when it comes to their health, making them vulnerable to diseases, including oral health-related diseases.

Oral diseases commonly found in children include periodontal disease and dental caries. In both developed and developing nations, dental caries is the most prevalent oral health problem affecting young children worldwide (Maklennan *et al*., 2024). According to a recent systematic review, early childhood caries remains a widespread issue, with prevalence reaching as high as 72% in certain regions (Maklennan *et al*., 2024). Oral diseases are among the most common non-communicable health issues, impacting nearly half of the global population, around 3.5 billion people at every stage of life, from childhood to old age (WHO, 2022). Yet, there seems to be no improvement in caries occurrence over the decades. According to Uribe *et al.* (2021), 573 million children suffered from untreated dental caries in primary teeth in 2015 (Uribe *et al.*, 2021). Similarly, in the UAE, the burden of dental

caries burden ranged from 74.1–83%, with reported caries experience (dmft) ranging between 3.07–10.9 among 4- to 5-year-olds (El-Nadeef *et al.*, 2010; Kowash, 2015; Kowash *et al.*, 2017).

Oral diseases such as dental caries, periodontal disease, and malocclusion continue to be major public health concerns in the UAE despite improvements in dental care services (Al Anouti *et al*., 2021). In a review on the dental caries epidemiology in children below 13 years old, Al-Bluwi (2014) noted that the prevalence of dental caries in the UAE was more apparent in children aged 5 to 6 years than in 12-year-old children. The prevalence of dental caries in children aged 4 to 6 in Abu Dhabi was between 78.9% and 95.0%, with a dmft range of 5.1 to 8.4. In Ajman, the prevalence ranged from 72.9% to 76.1%, with a dmft range of 4.4 to 4.5 (Al-Bluwi, 2014). This phenomenon is well below the WHO Health 21 goal, which aimed for at least 80% of children aged 5 to 6 years old to be caries-free by 2020 (Zheng *et al*., 2024). Besides, these statistical data highlighted that, despite government efforts, dental caries remains a widespread issue among younger generations, emphasising the urgent need for more effective prevention and intervention measures. Inadequate brushing habits and regular dental check-ups are still common among school-age children, contributing to continuing oral health problems (Al Anouti *et al*., 2021).

Recognising the severity of the issue, the UAE government has launched several programmes, including "Dubai Smiles Healthy" and "Abu Dhabi Smiles," to raise awareness of oral health issues and encourage preventive care. However, the long-term effectiveness of these efforts remains uncertain, necessitating continued evaluation and enhancement. Furthermore, there is a growing need for more comprehensive national research to assess the impact of these programmes and develop targeted preventive strategies (Al Anouti *et al*., 2021).

Untreated oral diseases in children can lead to persistent pain, difficulty in eating or drinking, speech development issues, hindered social interactions and play, reduced self-esteem, absence from school, and inability to concentrate in class, ultimately resulting in lower quality of life (QoL) (Rebelo *et al*., 2019). An estimated 51 million school hours are lost annually due to dental-related illnesses (National Institute of Dental Craniofacial Research, 2000). As young children spend most of their time with their families, their oral health not only affects them but also impacts their family members, particularly in psychological and economic aspects (Pahel *et al.*, 2007; Casamassimo *et al.*, 2009; Uribe *et al.*, 2021).

To assess the impact of oral diseases on children's QoL, many researchers have developed various Oral Health-Related Quality of Life (OHRQoL) measures in recent decades, however, there is a need for additional measures which are relevant for young children aged six years and younger (Tsakos *et al.*, 2012; Zaror *et al.*, 2019). Measuring the QoL in young children poses a significant challenge due to their age-dependent understanding of illness and health influenced by social, language, emotional, and cognitive development (Eiser *et al.*, 2000). Most measures rely on parents' perceptions when reporting their children's OHRQoL (Versloot *et al.*, 2004; Pahel *et al.*, 2007). There is also a self-report measure available for children aged five and below (Filstrup *et al.*, 2003). However, the authors did not demonstrate a tangible psychometric property for its construct validity and reliability (Pahel *et al.*, 2007; Tsakos *et al.*, 2012). Hence, further research is necessary to assess children's self-reports and the impact on OHRQoL.

Furthermore, since most parents are not always with their children due to work commitments, the information provided by proxy respondents may not align with their child's perception, especially regarding emotions (Jokovic *et al.*, 2004a; Barbosa

and Gavião, 2008). Consequently, the proxy's report can be complementary but should not be considered equivalent to their children's reports. Therefore, to appropriately assess the oral impact on OHRQoL, it is strongly recommended that both child and parental proxy reports be incorporated. Both sources may provide crucial information on the different aspects of QoL (Abanto *et al.*, 2014).

Formerly, the Scale of Oral Health Outcomes for 5-year-old children (SOHO-5) was developed in the United Kingdom (UK) to facilitate the assessment of the oral impact in daily activities on OHRQoL in young children (Tsakos *et al.*, 2012). The SOHO-5 provides both child self-report and proxy report. It has proven to be a reliable and valid measure for children aged 5 years old. Besides dental caries, some researchers have used it to assess other pathologies, such as traumatic dental injuries (Abanto *et al.*, 2014). Currently, the SOHO-5 is considered a generic oral health-related quality-of-life instrument for preschool children, aside from the Early Childhood Oral Health Impact Scale (ECOHIS) (Zaror *et al.*, 2019).

A study by Singh *et al*. (2020) emphasises that even children as young as 36 months are capable of articulating their perceptions of OHRQoL. Their findings highlighted that children's self-reports are both valid and reliable, making child questionnaires a valuable tool for assessing the impact of oral health conditions. This study reinforces the importance of incorporating children's perspectives when evaluating their oral health outcomes, rather than relying solely on parental or caregiver reports. Given that children at this developmental stage begin to compare themselves with their peers in terms of appearance and identity, their self-assessments provide meaningful insights into their experiences and overall well-being (Singh *et al*., 2020).

Therefore, SOHO-5 can be considered the most appropriate tool to measure children's response to the impact of oral diseases on their QoL. In view that SOHO-5 is not available in the Arabic language, this study aims to culturally adapt the SOHO-5 to the Arabic language and assess the impact of oral conditions on preschool children's QoL in the UAE.

1.2 Problem Statement

There are limited OHRQoL measures in young children due to methodological and conceptual challenges, particularly in children's understanding of illness and health. In 2012, Tsakos *et al.* (2012) developed SOHO-5 to assess the impact of oral conditions in 5-year-old children from a child's self-report. At present, some authors from different countries have culturally adapted and translated SOHO-5 into their languages such as the Portuguese language (Abanto *et al.*, 2013b), Indonesian language (Rachmawati *et al.*, 2017), Spanish language (Abreu-Placeres *et al*., 2017), Persian language (Asgari and Kazemi, 2017), Chinese language (Gao *et al*., 2020), Bengali language (Mishu *et al.*, 2021), Turkish language (Bani *et* al., 2021), Thai language (Ariyavutikul *et al*., 2023), and Myanmar (Burmese-speaking) language (Min *et al*., 2023).

In the United Arab Emirates, oral health conditions among young children represent a significant public health challenge. Recent studies in the UAE demonstrate persistently high rates of dental caries among preschool children. A 2017 study conducted in Ras Al-Khaimah found a caries prevalence of 74.1%, with a mean dmft score of 3.07 among children aged 4 to 6 years (Kowash *et al*., 2017). Similarly, the 2018 Abu Dhabi 'Nutrition, Oral Health, Physical Development, Lifestyle, Anthropometry and Socioeconomic Status' (NOPLAS) project reported a caries

prevalence of 41%, with a mean dmft score of 1.70 among children aged 18 months to 4 years (Elamin *et al*., 2018). More recent systematic reviews found that among all the diseases that affect children in the UAE, oral diseases particularly early childhood caries, are the most common despite improvements in the provision of oral health services (Al Anouti *et al*., 2021).

Furthermore, risk factors included higher consumption of snacks, being in public schools, lower maternal education level, and socioeconomic status. Suboptimal oral hygiene practices and low utilisation of dental services were also identified (Al Anouti *et al*., 2021).

Untreated dental caries significantly impacts children's daily functioning, leading to school absenteeism, dental pain, and difficulties in eating, sleeping, and concentrating (Santos *et al*., 2022; Paredes *et al*., 2021). These effects can result in broader health consequences, such as nutritional deficiencies, stunted growth, and underweight due to impaired chewing ability (Sheiham, 2006; National Institute of Dental and Craniofacial Research, 2022). In addition to physical health issues, children with poor oral health often experience reduced self-esteem, embarrassment, and social withdrawal (Pakkhesal *et al*., 2021). Moreover, disrupted sleep patterns serve as both a risk factor for and a consequence of early childhood caries, exacerbating its negative effects on overall development (Sardana *et al*., 2023).

The UAE's unique demographic composition, with both Emirati nationals and a large Arabic-speaking expatriate population from various countries, necessitates culturally and linguistically appropriate assessment tools. Enhancing oral health status is one of the key public health goals in the country (Al Anouti *et al*., 2021). Without a culturally adapted and validated Arabic version of the SOHO-5, healthcare providers in the UAE lack a standard tool to assess how oral conditions affect young children's

daily lives, social interactions, and well-being from the child's perspective. This gap limits the ability to evaluate treatment outcomes, develop targeted interventions, and contribute to international comparisons in paediatric OHRQoL research.

Regarding the Arabic version of SOHO-5 (A-SOHO-5), there is no known published article related to translation and cultural adaptation, including the psychometric assessment of SOHO-5 in the Arabic language. Technically, we have found a published article in 2019 entitled "*Comparison of the Arabic Versions of the Early Childhood Oral Health Impact Scale (ECOHIS) and the Scale of Oral Health Outcomes-5 (SOHO-5) in Assessment of Oral Health Related Quality of Life*" (Al Qabbani, 2019). However, a search in the Semantic Scholar website has yielded an abstract only with the same title; "*Comparison of the Arabic Versions of the Early Childhood Oral Health Impact Scale (ECOHIS) and the Scale of Oral Health Outcomes-5 (SOHO-5) in Assessment of Oral Health-Related Quality of Life*", albeit by a different author named Tahir Mehmud in 2018. However, the comparative nature of the study in comparing two scales renders it unsuitable for a validation study. Besides, it is not a cross-cultural study report and hence does not adequately validate SOHO-5.

After analysing Al Qabbani's full article, there were no clear details about Cross-Cultural Adaptation (CCA), how many members were involved in the translation, no pilot study was mentioned, and no clear evidence of the psychometric phase and psychometric analysis was revealed. The author also mentioned that the SOHO-5 questionnaire had a total of 8 items, and the ECOHIS questionnaire had a total of 12 questions. However, the correct number of items is 7 for SOHO-5 and 13 for ECOHIS. Also, the author did not mention global rating questions. In addition, the journal in which the article was published and the university that granted the ethical

approval for the study were contacted twice to get the Arabic-translated version and obtain the author's contact details, but no avail.

In the context of the UAE's linguistically and culturally diverse Arabic-speaking population, and given the current lack of a validated Arabic version, therefore, this study fills an important gap by developing a culturally adapted tool to assess OHRQoL in preschool children. To achieve this, we will adopt a comprehensive modified CCA process designed to maximise the achievement of equivalences, namely semantic, item, operational, measurement, functional and conceptual, between the source questionnaire and the target language. Therefore, our main goals are to adapt SOHO-5 for use in Arab populations and to investigate the validity and reliability of the A-SOHO-5.

1.3 Justification of The Study

The OHRQoL measures have been developed to measure the impact of oral conditions in multiple dimensions in young children (Sischo and Broder, 2011). The reports provided by proxies may be underrated or overrated, and were not identical to their children (Barbosa and Gavião, 2008). Evidence has shown that children aged 4 to 6 years old have the ability to self-report the impact of their general health, which includes pain and physical dysfunction (Connolly and Johnson, 1999). This is supported by studies which have proven that young children could provide self-reports on the impact of early childhood caries on their QoL (Filstrup *et al*., 2003; Singh *et al*., 2020).

A child self-report measure namely the SOHO-5, has been developed and is available in English (Tsakos *et al*., 2012). Since it was developed in an English-speaking country, we aimed to culturally adapt it to the Arabic language and fill the

gaps in the previously published article about a translated Arabic version. Complementary to the parental report, the child self-report is very useful because it permits the assessment of young children's perceived needs, gives information on the level of care required, and facilitates the policymakers to plan for effective oral health programmes (NOHPS, 2015). Furthermore, using a standardised and validated tool enables dental professionals to compare the results within and between countries.

The SOHO-5 was chosen for this study due to its suitability for young children's self-reporting and specifically designed for 5-year-olds. It includes only seven items in both the child and parent versions; fewer than other available instruments such as the Michigan-OHRQoL which has 9 (child items) and 10 (parent items). Its short format is appropriate for the developmental stage of preschool-aged children. Moreover, the tool has shown strong psychometric validity and has been successfully adapted across different languages and cultural contexts. Its dual-format structure also allows for meaningful comparisons between child and parent perceptions of oral health.

1.4 Implications of OHRQoL Research and Health Policy

The enduring issue of low oral healthcare utilisation and poor oral health is often the result of unequal access to care (Petersen *et al*., 2005; Edelstein, 2006; Sisson, 2007). Given the current economic and health challenges, access to healthcare is of prime importance. Leveraging the link between oral health issues and QoL can be an effective mechanism to communicate with policymakers to demonstrate the importance of oral health and equitable access to care (Al Shamrany, 2006). With the increasing treatment options and the diversity of patient samples, sociocultural and

psychological factors need to be considered when assessing needs, outcomes, and clinical practice.

Given the cost-related differences in access to care and rationing of treatments, comparing the QoL between treatment groups can help inform decision-making for patients, healthcare providers, and policymakers. Recent legislation aims to improve oral health by increasing access to care and drawing research attention to subjective patient assessments related to OHRQoL. On a similar note, given the prevalence and preventable nature of dental caries, measuring the impact of these services before and after treatment can improve evidence-based decision-making related to treatment needs, efficacy, and policy perspectives. Additionally, given the importance of health disparities to public policy, it is not surprising that the National Institutes of Health (NIH) and the National Institute of Dental and Craniofacial Research (NIDCR) are committed to supporting oral health disparities research. The NIDCR has supported research centres to reduce oral health inequalities since 2001. To date, both the Boston University centre and the University of California CAN-DO are investigating the impact of Early Childhood Caries (ECC) on OHRQoL in young children (Cunnion *et al*., 2010). Currently, the Agency for Healthcare Research and Quality (AHRQ), NIDCR, and other NIH institutes are seeking to sponsor research on the comparative effectiveness of care. The Patient-Centred Outcomes Research Institute was also established to assess treatment effectiveness and provide better information to patients and their physicians. Such efforts emphasise and support the application and relevance of HRQoL assessments. The NIH has incorporated HRQoL research into its roadmap and emphasises patient-centric outcomes.

Currently there are at least three NIDCR-funded projects investigating OHRQoL across the lifespan from infancy to old age, across geographic regions (e.g.

urban, rural, and international), and across chronic conditions such as cleft lip and palate. NIDCR also supports research examining correlates of OHRQoL (e.g. body image, health beliefs) and research attempting to uncover social determinants of oral health. In accordance with the NIH roadmap, Dental Practice Based Research Networks (DPBRNs) have been created to improve care and improve population health. These networks are based on evidence-based dentistry that integrates scientific evidence, the clinical expertise of dentists, and patient needs and preferences (Sischo and Broder, 2011). An integral part of DPBRNs is subjective patient ratings about their oral health and treatment experiences. According to the Practitioners Engaged in Applied Research and Learning (PEARL) Network, by measuring OHRQoL in their patients, oral health professionals can improve evidence-based care (Botello-Harbaum *et al*., 2012). Currently, the PEARL network is completing longitudinal protocols to compare objective (clinician ratings) and subjective ratings (patient OHRQoL ratings) to measure treatment outcomes. The study results will elucidate the interrelationships between oral healthcare and QoL factors. The PEARL projects illustrate how patients are an invaluable source of information regarding treatment protocols and outcomes and how oral health is related to QoL. In short, applied science is translational, and QoL assessments can be at the heart of evidence-based clinical care. Assessments of patients' and residents' perceptions of health can improve our understanding of healthcare access, expectations, and treatment effectiveness (Botello-Harbaum *et al*., 2012).

1.5 Conceptual Framework of the SOHO-5 Adaptation and Validation Study

The conceptual framework of this study integrates the theoretical foundation of the SOHO-5 instrument with the methodological processes required for its cross-cultural adaptation (CCA) and psychometric validation. OHRQoL refers to an individual's subjective assessment of comfort and well-being in relation to eating, sleeping, social interaction, self-esteem, and overall satisfaction with oral health (National Institute of Dental and Craniofacial Research, 2000). OHRQoL is influenced by the interaction between oral health conditions and various contextual factors, including demographic and socioeconomic status, environmental conditions, oral health behaviours, and general health status. It is commonly conceptualised through four interrelated dimensions: functional, physical, social, and psychological (Sischo and Broder, 2011).

Several instruments have been developed to assess OHRQoL in young children, most of which rely on proxy reporting by a parent or caregiver. These include the Early Childhood Oral Health Impact Scale (ECOHIS) (Pahel *et al*., 2007), the Dental Discomfort Questionnaire (DDQ) (Versloot *et al*., 2004), and the Oral Health–Related Early Childhood Quality of Life measure (OH-ECQoL) (Mathur *et al*., 2014). However, child self-report tools remain limited. Notable exceptions include the Michigan-OHRQoL (Filstrup *et al*., 2003) and the Scales of Oral Health Outcomes for 5-year-old children (SOHO-5) (Tsakos *et al*., 2012).

The SOHO-5 was developed to address the need for a reliable, child-centred OHRQoL instrument and has demonstrated suitability for use with 5-year-old children. In Brazil, 90.3% of children were able to understand and appropriately respond to all SOHO-5 items (Abanto *et al*., 2013b). The tool captures the impact of oral conditions on a

child's daily activities by assessing disruptions to functions such as eating, drinking, speaking, playing, sleeping, and smiling, whether due to pain or appearance. These aspects align with the physical, social, and psychological dimensions of OHRQoL.

Oral conditions like dental caries, traumatic dental injuries, oral–facial abnormalities, and malocclusion have been shown to negatively influence children's quality of life (Abanto *et al*., 2014). Dental caries, in particular, is a multifactorial non-communicable disease. Tsakos *et al*. (2012) found that 49% of children experienced at least one oral impact related to untreated caries. The occurrence and severity of caries are shaped by several determinants, including demographic and socioeconomic background, environmental influences, oral hygiene behaviours, and the general health of the child (Almajed *et al*., 2024). Evidence suggests that children from low-income families and those whose mothers have lower educational attainment are more likely to experience higher caries prevalence and poorer OHRQoL outcomes (Abanto *et al*., 2014; Rachmawati *et al*., 2017). In this study, the SOHO-5 was selected for CCA and validation for use among Arabic-speaking preschool children in the United Arab Emirates (UAE). The adaptation process followed Beaton *et al*.'s (2000) guidelines, with modifications made to reflect UAE's multicultural and linguistic context. The universalist model proposed by Herdman *et al*. (1998) was adopted to ensure cross-cultural equivalence across six domains: semantic, item, operational, measurement, functional, and conceptual. Although several CCA methods exist, no single method is universally recognised as a gold standard. Therefore, adaptations are tailored to suit the specific needs of the target population and context (Gjersing *et al*., 2010; Epstein *et al*., 2015).

The adaptation was conducted in two phases. Phase I comprised six stages: (i) forward translation, (ii) synthesis, (iii) back translation, (iv) expert committee

review, (v) pre-testing, and (vi) submission and appraisal of all related documentation, based on modified Beaton *et al*. (2000) guidelines. Phase II focused on the psychometric evaluation of the Arabic SOHO-5, assessing its validity (face, content, construct, and criterion) and reliability (internal consistency and test–retest), in line with Fayers and Machin (2013). Both the child self-report and parent-proxy versions of the SOHO-5 were culturally adapted and validated. Thus, the conceptual framework presented here reflects a comprehensive approach that combines robust OHRQoL measurement with a culturally appropriate adaptation strategy, ensuring the tool's applicability to the Arabic-speaking preschool population in the UAE (Figure 1.1).

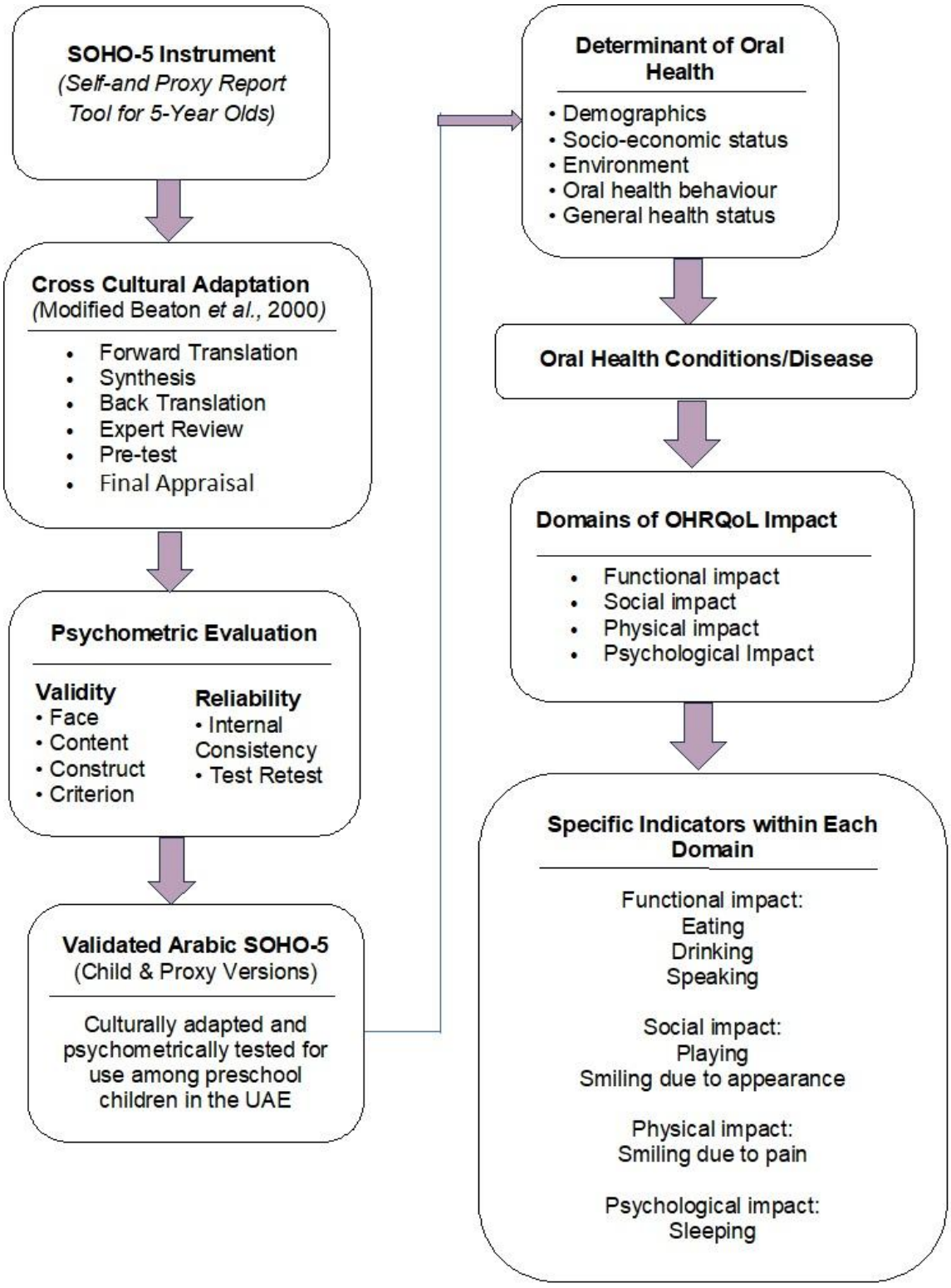

Figure 1.1: Conceptual Framework of the SOHO-5 Adaptation and Validation Study

1.6 Research Questions

1. Can the original SOHO-5 be successfully translated and culturally adapted into Arabic for use among 5-year-old children in the UAE?
2. Does the A-SOHO-5 demonstrate acceptable validity (face, content, convergent, and construct) and reliability (internal consistency and test–retest) for both child and parent versions?
3. How do oral health conditions impact the OHRQoL of 5-year-old preschool children in the UAE, based on self-reports and parent-reports using the A-SOHO-5?
4. What clinical and socio-demographic factors are associated with children's OHRQoL, as measured by the A-SOHO-5 total score and its binary categorisation?

1.7 Research Hypothesis

1. The overall Coefficient alpha value of A-SOHO-5 is above 0.7.
2. A-SOHO-5 demonstrates strong test-retest reliability with no significant differences between repeated measures.
3. The Intraclass Correlation Coefficient of A-SOHO-5 is above 0.75.
4. Preschool children with caries have higher A-SOHO-5 scores than the non-caries group.
5. A-SOHO-5 score has a positive correlation with the A-ECOHIS score.
6. A-SOHO-5 score has a positive correlation with the global rating questions scores. Children reporting dissatisfaction with their teeth or holes, and those whose parents report poor dental health, low satisfaction, or need for treatment, are expected to have higher A-SOHO-5 scores.

7. Oral conditions have negative impacts on the QoL of 5-year-old preschool children in the Emirates of Sharjah and Ajman, UAE.
8. Total A-SOHO-5 score and binary A-SOHO-5 categorisation effectively identify the factors associated with OHRQoL in preschool children.

1.8 Objectives

1.8.1 General Objective

To cross-culturally adapt and validate the original E-SOHO-5 into Arabic for use among 5-year-old children and their parents in the UAE, and to evaluate their OHRQoL through self-reports and parental reports, as well as to assess the associated factors.

1.8.2 Specific Objectives

This study was carried out in two stages:

1.8.2.(a) Stage I: CCA and Validation of the A-SOHO-5

a. To adapt the E-SOHO-5 questionnaire for Arabic-speaking populations through a systematic CCA process, which includes forward translation, synthesis of translations, backward translation, expert committee review, pilot testing, and final submission and appraisal by the expert committee for any necessary modifications.

b. To evaluate the psychometric properties of A-SOHO-5 by assessing:

1. The internal consistency reliability, including inter-item correlations, Cronbach's alpha, item-total score correlations, and split-half reliability.
2. The test-retest reliability of A-SOHO-5.

3. The Intra Class Correlation Coefficients (ICC), to evaluate the absolute agreement reliability of the A-SOHO-5 by analysing single and average measures, providing insights into the reliability and consistency of the scale across respondents.
4. The discriminant validity by analysing its relationship with caries experience status (caries vs. non-caries) based on the dmft index.
5. The convergent validity by assessing the correlation between A-SOHO-5 child and parent versions.
6. The construct validity of A-SOHO-5 by examining its correlation with the A-ECOHIS, a validated instrument that measures a similar construct.
7. The construct validity of A-SOHO-5 through its relationship with global rating questions, for both children and parents.

1.8.2.(b) Stage II: Assessing the impact of oral conditions on preschool children's QoL.

1. To assess the self-reported OHRQoL of children using the A-SOHO-5 questionnaire child version.
2. To assess the parent-reported OHRQoL of children using the A-SOHO-5 questionnaire parent version.
3. To evaluate the impact of dental caries experience on self-reported and parent-reported OHRQoL in preschool children.
4. To explore the relationship between socio-demographic factors, clinical measures, and OHRQoL in young children in terms of total A-SOHO-5 score and its binary categorisation.

CHAPTER 2

LITERATURE REVIEWS

2.1 Introduction

This literature review is divided into two components. The first component describes the literature concerning the most common oral diseases related to preschool children, their impact on OHRQoL, and the associated factors. This chapter also discusses the OHRQoL indices used globally. The latter part discusses the theoretical aspects of the material and methods used in this study, including questionnaire translation, data collection methods, data analysis, and the validation process.

2.2 Classification of Children

According to the United Nations International Children's Emergency Fund (UNICEF), 2,415,319,658 children under the age of 18 were reported globally in 2023, 654,028,321 of them under the age of five years (UNICEF Data, 2024). In general, children can be classified into a few age categories, reflecting the biological, developmental, psychological, and social changes related to chronological age changes (Williams *et al*., 2012). Children are classified as toddler (13 months – 2 years), early childhood (2y – 5y), middle childhood (6y – 11y), and early adolescence (12y – 18y). Age groupings are also used for education and healthcare systems as an indication of suitability for entry (Clark *et al*., 2015). In addition, age groups exist for many tools that measure developmental and psychological functions, and many biological tests have age-based reference standards for results. Grouping children according to age can provide a practical advantage over more complex assessment methods for use by clinicians, services, and caregivers when deciding intervention suitability (Clark *et al*.,

2015; OECD, 2023). For example, cognitive behaviour therapy may be effective in older children but not young children because it relies on the level of intellectual maturity (Halder and Mahato, 2019; Creswell *et al*., 2024).

2.3 Oral Health Among Preschool Children

Oral health issues in children, particularly preschool children, are of significant concern due to the impact on growth, development, and QoL. Similar to an adult, children also suffer from various oral diseases. Apart from the most common oral diseases caused by dental caries and gingivitis, other oral diseases found among children are tooth sensitivity, malocclusions (bite and alignment issues), tongue thrusting, premature tooth loss, and dental emergencies/dental trauma. Globally, measurements of oral health status among children, especially preschool children, were made by comparing dental caries and periodontal disease (Naidoo and Myburgh, 2007; Han *et al*., 2025).

2.4 OHRQoL in the UAE and Gulf Cooperation Council (GCC) Countries

Recent findings among older Emirati adults showed that nearly half rated their oral health as poor, while only one-third considered it good (El-Dahiyat *et al*., 2025). Results from the Geriatric Oral Health Assessment Index (GOHAI) indicated significant effects on self-perceived oral function and overall well-being, highlighting significant unmet oral health needs in this population (El-Dahiyat *et al*., 2025). Among school-aged children, national surveys reported a caries prevalence of 54% to 65%, indicating a considerable oral health burden that may negatively impact their daily functioning and quality of life (QoL) (Al Anouti *et al*., 2021). A study conducted in the UAE among preschool children who received dental treatment under general

anaesthesia found notable improvements in pain levels, eating ability, sleep quality, and parental distress. Using the ECOHIS, the findings revealed large effect sizes in both the child and family sections, highlighting the significant positive impact of dental treatment on OHRQoL (Al Antali *et al*., 2019).

Despite notable improvements, significant gaps remain. Recent epidemiological reviews indicate that untreated dental caries continue to affect children's general health, development, and school performance, including reduced attendance and academic outcomes, highlighting the ongoing need for preventive efforts and school-based oral health programmes (Rebelo *et al*., 2019; Al Anouti *et al*., 2021). In addition, a recent study in the UAE among older adults identified dry mouth (OR = 2.21) and chewing difficulties (OR = 1.87) as the key predictors of poor OHRQoL, emphasising the continuous impact of unresolved oral conditions on health, nutrition, and daily functioning (El-Dahiyat *et al*., 2025).

Across the broader Gulf Cooperation Council (GCC) region which includes Saudi Arabia, Kuwait, Qatar, Oman, and Bahrain, similar trends of compromised OHRQoL have been observed. For example, a study in Saudi Arabia reported that untreated dental caries and increasing age were significant predictors of poor OHRQoL in children, regardless of their socioeconomic status (Almajed *et al*., 2023). A cross-sectional study comparing children aged 5-9 years in Riyadh and Kuwait City after the COVID-19 pandemic found no significant differences in overall OHRQoL scores, as measured by the Arabic version of the Child Oral Health Impact Profile-Short Form (COHIP-SF). However, age and gender emerged as significant predictors of OHRQoL in Kuwait, but not in Riyadh, indicating possible city-specific differences in perceived oral health impacts (AlHayyan *et al*., 2023). Although evidence from countries such as Qatar, Oman, and Bahrain remains limited, a regional systematic

review reported a high prevalence of dental caries among preschool children in the GCC, estimated at 80.9%, with a mean dmft score of 5.14. These findings reflect a significant oral disease burden in this age group (Al Ayyan *et al*., 2018).

Common challenges across the GCC include the limited clinical use of culturally adapted, age-specific OHRQoL instruments and the insufficient integration of patient-reported outcomes into routine dental care. The COVID-19 pandemic further exacerbated these issues by disrupting access to dental services. These findings underscore the urgent need for coordinated, evidence-based oral health policies in the region. Particular attention should be given to preventive care, routine application of validated OHRQoL measures, and enhanced access to paediatric dental services (El-Dahiyat *et al*., 2015; Al Ayyan *et al*., 2018; Al Antali *et al*., 2019; Rebelo *et al*., 2019; Al Anouti *et al*., 2021; Almajed *et al*., 2023; AlHayyan *et al*., 2023).

2.5 Dental Caries

Dental caries, also known as tooth decay or cavities, is a multifactorial oral disease of the enamel. It is initiated by acidic by-products from bacterial fermentation of dietary carbohydrates, which lead to the demineralisation of the enamel and dentine (Fejerskov, 2004; Spatafora *et al*., 2024). This results in the destruction of the hard tissues of the teeth, leading to the formation of cavities, pain, and potential tooth loss if left untreated (Pitts, 2004; Spatafora *et al*., 2024). The main bacteria responsible for caries development are *Streptococcus mutans and Lactobacillus species* (Loesche, 1986; Spatafora *et al*., 2024).

ECC is a severe form of dental caries that affects the primary teeth of infants and young children and can lead to pain, infection, and premature tooth loss (Alazmah, 2017; Patel *et al*., 2025). ECC is a condition characterised by the presence of one or

more decayed, either non-cavitated or cavitated lesions, missing due to caries, or filled tooth surfaces in any primary tooth of a child who is 71 months old or younger (Tungare and Paranjpe, 2023; Patel *et al*., 2025). In children under the age of three, the presence of any sign of smooth-surface caries indicates Severe Early Childhood Caries (S-ECC) (Çolak *et al*., 2013; Patel *et al*., 2025). Sometimes it is also referred to as baby bottle tooth decay, nursing bottle caries, or prolonged nursing habit caries, where, in severe cases, this disease can even lead to tooth loss and infection (Anil and Anand, 2017; Patel *et al*., 2025).

2.6 Epidemiology of Dental Caries

Dental caries is a prevalent chronic disease globally, affecting people of all ages. The World Health Organization (WHO) estimates that nearly 60-90% of school-aged children and almost 100% of adults worldwide have experienced it (WHO, 2017; Alshayeb and Dashash, 2025). In high-income countries, the prevalence of dental caries in children has decreased due to improved oral hygiene and preventive measures. However, it remains a significant public health issue in low-and middle-income countries (Petersen, 2003; Alshayeb and Dashash, 2025).

In the Gulf region, dental caries represents a significant public health challenge among children. In the United Arab Emirates, a study conducted in Ras Al-Khaimah found that 74.1% of preschool children (aged 4-6 years) had early childhood caries with a mean dmft of 3.07 (Kowash *et al*., 2017), while a WHO Eastern Mediterranean Region meta-analysis that included three UAE studies reported a pooled prevalence of 65% for 5–year–old children (Kale *et al*., 2020). A systematic review of oral health among children and adolescents in the UAE over the past decade highlighted the high prevalence of dental caries across all emirates (Al Anouti *et al*.,

2021). In Saudi Arabia, the most recent systematic review and meta-analysis covering data from 2011 to 2023 reports an average prevalence of 75.43% in primary teeth with a mean dmft of 4.14, and 67.7% in permanent teeth with a mean DMFT of 1.28 (Khan *et al*., 2024). A recent meta-analysis of school children in Saudi Arabia found caries prevalence of 84% among children aged 5–7 years and 72% among children aged 12–15 years (Adam *et al*., 2022). Country-specific data revealed high caries prevalence in Qatar, where the rates reached 73% (DMFT = 4.5) among children aged 6–15 years, and up to 85% among 12–14-year–olds. In Oman, prevalence was 58.1% (DMFT = 1.53) among 12–year–olds, and the DMFT increased to 3.23 among 15–year–olds. In Kuwait, reported prevalence ranged from 18.8% to 52% across different age groups and study years (Alayyan *et al*., 2018). Similarly, in the Asian region, dental caries remains highly prevalent among preschool children, reflecting a significant burden of disease across several countries (Oral Health Division, 2015; Su *et al*., 2018).

According to a systematic review and meta-analysis of research conducted between 1998 and 2019 using WHO diagnostic criteria, ECC affects approximately half of preschool-aged children globally, with an estimated prevalence of 48% among this age group. The prevalence varies by region, with Asia and Oceania reporting noticeably higher occurrences and Africa having the lowest rates. On the other hand, the prevalence rates in Europe and the Americas are very similar to the global average (Uribe *et al*., 2021).

The recent analysis of the global burden on ECC by Bencze *et al*. (2021) found that in 2019, the average incidence rate of dental caries in primary teeth for children under five years old in the European Union (EU) was 38,818 per 100,000. The prevalence of dental caries among children under five in the EU was 37.2% in