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Cross-cultural adaptation and psychometric evaluation of the child oral health impact profile-short form 19 (COHIP-SF 19) for Ethiopian schoolchildren



Yilkal Tafere^{1,2*}, Achenef Asmamaw Muche¹, Amare Tariku³, Alemnew Athirsaw⁴ and Kassahun Alemu¹

Abstract

Background Poor oral health can cause pain, discomfort, and reduced oral health-related quality of life (OHRQoL) affecting children's social interactions, self-esteem, and school participation. Understanding OHRQoL and its impact is essential for designing effective oral health strategies. The Child Oral Health Impact Profile (COHIP-SF19) assesses OHRQoL in children but lacks validation in diverse cultural contexts, including Ethiopia. This study aimed to adapt the COHIP-SF 19 to Amharic and evaluate its psychometric properties among schoolchildren in the Amhara region.

Methods The original English COHIP-SF 19 was translated into Amharic (COHIP-SF 19) using a standard forward and backward translation procedure, followed by **cultural adaptation** to ensure the tool's relevance and accuracy in the Ethiopian context. 400 schoolchildren who were grades 6 to 8th included Internal consistency reliability, test-retest reliability, discriminant validity, convergent validity, and floor and ceiling effects computed to evaluate the Amharic version of COHIP-SF 19. A Mann-Whitney U test was used to compare mean scores of COHIP-SF 19 based on participants' caries status and self-reported oral health rating.

Results Mean age of the schoolchildren was 13.3 ± 0.97 years and 51.5% of them were female. The mean scores for the socio-emotional, oral health, and functional subscales were $29.35 (\pm 7.765)$, $13.21 (\pm 3.99)$, and $9.99 (\pm 3.29)$, respectively. Both the internal consistency (Cronbach's alpha = 0.90) and test–retest reliability (intra-class correlation coefficient (ICC) of (0.89) were found **within an acceptable range**. Discriminant validity was confirmed via the Mann-Whitney U test, showing that children without dental caries had significantly higher COHIP-SF19 scores (Z = -13.81, p < 0.001). Overall, the Amharic version COHIP-SF19 showed an acceptable level of equivalence to the original version.

Conclusion In this study, the COHIP-SF19 Amharic version demonstrated adequate cultural validity and reliability for assessing Oral Health-Related Quality of Life in Ethiopian schoolchildren. It is suitable for use in clinical practice, service evaluation, and research to measure OHRQoL among Ethiopian schoolchildren.

Keywords Quality of life, Children, Oral health, Reliability, Cross-cultural adaptation, Ethiopia

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Introduction

Oral health is defined as the ability to speak, smile, taste, chew and swallow, as well as to transmit emotions through facial expressions with confidence, without pain, and discomfort [1]. Oral health problems, such as dental caries and gum diseases, are prevalent globally and significantly affect the quality of life among schoolchildren. These issues can lead to pain and functional limitations, impacting children's abilities to eat, speak, and engage socially [2, 3]. Untreated dental caries affect approximately 60–90% of schoolchildren worldwide, contributing to absenteeism and poor academic performance due to pain and the need for dental treatment [4, 5].

Oral health-related quality of life (OHRQoL) impacts physical, psychological, functional, and social aspects of life, significantly influencing children's overall quality of life [6–8]. Quality of life only has meaning on a personal level and is understood differently in the various cultures, which requires adapting the tool to assess the socio-cultural environment in which they are to be applied [6]. Accurately estimating the magnitude of OHRQoL and associated oral health issues among schoolchildren is essential for informing public health policies and effectively allocating resources. In response to these needs, instruments to measure the subjective aspects of oral health, OHRQoL have been developed [9].

Child development is a dynamic process influenced by a wide range of biological and environmental factors. This growth and change make it impractical to create a single tool applicable to all ages. Over the last decade, numerous oral health-related quality of life (OHRQoL) tools have been developed for children and adolescents [10], each with varying characteristics and advantages. Some of these tools are specifically designed for certain age groups, one of which is the Child Oral Health Impact Profile (COHIP) [11]. However, measuring this complex construct in children remains challenging. Various tools, including COHIP-SF 19 [12] have been developed globally to assess OHRQoL among children. When selecting an appropriate tool for measuring OHRQoL, it is essential to consider psychometric properties, cultural relevance, ease of use, and the specific aspects of quality of life being evaluated [13–15].

COHIP-SF 19 is one of those modalities that measure OHRQoL of children and it contain both the positive and negative health impact of the different oral conditions. The COHIP-SF 19 scale was originally developed in the United States of America to measures various aspects of OHRQoL, including functional limitations, psychological discomfort, and social well-being among children [12]. Oral health related quality of life instruments must be valid and reliable [16]. The COHIP-SF 19 has shown good psychometric properties in different communities [17] and it has been validated and used in multiple countries, such as Brazil [18], China [19], Germany [20], Japan [21], Indonesia [22], Myanmar [23]Libya [24], and France [25]. To meet the various population, the scale has also been translated and validated in other languages. The validated language versions of the OHIP-SF 19 scale are English [18], Arabic [24], French [25], Chinese [19], Indonesian [22], and Japanese languages [21]. While the COHIP-SF 19 scale has shown good psychometric properties in diverse populations, its applicability for Amharicspeaking children in Ethiopia remains unexplored. This gap underscores the urgent need for reliable, culturally appropriate tools to assess the impact of oral health on the lives of schoolchildren in Ethiopia. Therefore, the aim of this study was to investigate the cross-cultural validity of the COHIP-SF 19 scale and evaluate its psychometric characteristics among Amharic-speaking schoolchildren in northwest Ethiopia.

Methods

Study design

The study was a cross-cultural adaption and psychometric evaluation study.

Study setting

This study was conducted in the East Gojjam zone, northwest Ethiopia. Amharic language is the national language of the country and first language for the study setting schoolchildren.

Study population, sample size and sampling

For checking the meaning clarity of wording, completeness, and relevance of the COHIP-SF-19 scale and its conceptual subscale and the response options twenty schoolchildren grade (6th - 8th) were recruited. For the Psychometric testing of the scale, a target population of schoolchildren enrolled in public primary schools in 2023/2024 academic year were included. Schoolchildren whose families unable to give written informed consent were excluded. We opted to use a sample size of 400 schoolchildren on the basis that it would be sufficiently accurate for our needs (ensure quantitative validation [26]. A two-stage cluster sampling technique was employed to enhance diversity by stratifying schools into urban and rural categories. Three urban schools and two rural schools were randomly selected. In the rural schools, two classes from the 6th grade and one class each from the 7th and 8th grades were chosen randomly. For the urban schools, two classes were selected from each grade (6th, 7th, and 8th). This approach ensured a representative sample of students across academic levels. In addition, 100 samples were randomly selected from the initial sample and re-interviewed two weeks after the original interviews to check the consistency of the scale.

COHIP-SF 19 scale

The COHIP-SF 19 scale consists of 19 items [12], which form three conceptual subscales: oral health (five items), functional well-being (four items), and socio-emotional well-being (10 items). Out of the 19 items, two were framed as positively worded questions. A five-point Likert scale was utilized, ranging from 'never' to 'almost all the time? Responses to these two positively worded questions were scored as follows: 'never' = 0 and 'almost never' = 1, "sometimes" = 2, "fairly often" = 3, and "almost all the time" = 4. Scoring for the 17 negatively, worded items were reversed. The overall score was calculated by summing the scores for all 19 items within a range of 0-76. Socio-demographic information was gathered in conjunction with the scale. The higher scores indicated a more favorable Oral Health-Related Quality of Life (OHRQoL).

Cross-cultural adaptation process Translation and adaptation process

An approval was obtained for English version of COHIP-SF 19 from the developer, professor Broder [12], and it was translated and adapted following standard cross-cultural adaptation guidelines including language, setting, time and statistical considerations), as well as quality criteria proposed for measurement properties of health status questionnaires [13-15]. In addition, different equivalence of the scale and its subscales was assessed based on different definitions and criteria such as the conceptual equivalence pursued through a rigorous process, including forward and backward translation. Item equivalence is considered the degree to which the items composing the instrument are identical across cultures. Operational equivalence refers to the possibilities of using a similar questionnaire format, instructions, mode of administration and measurement methods [13, 15].

Two translators who were fluent in target language (Amharic) with a good understanding of the original language (English) first independently translated the instrument into Amharic language. Bilingual translators whose mother tongue is the target language (Amharic) produce the two independent translations. The first translator is a dentist and the second translator is English language expert. The translated versions were synthesized into one version by the research team, expert committee and the two translators; a single consensus version was then compiled. In cases of disagreement between the two translators, during synthesis, a third group of experts (a dentist, an Amharic language expert, and a public health expert) was invited to discuss and resolve the disagreement. The consensus version was back translated to English by two translators who were fluent in original language (English), good understanding of target language (Amharic). Thereafter the translated version was synthesized by the research team, expert committee and the two back translators; a single consensus version was then compiled ('Table S1). Thereafter the synthesized forward translated and synthesized back-translated versions were reviewed by an expert committee. Their task was to integrate all versions of the questionnaire and produce the pre-final draft for field-testing.

Furthermore, twenty schoolchildren which was selected purposively were asked regarding to each item in terms of the legibility, clarity, and cultural suitability of the Amharic version of the scale to oral health and its conceptual subscale as part of the validation of the study. Based on the feedback received from the participants, the members of expert committee and the research team reviewed and modified the questionnaire for proper wording and layout the final version was developed. This collaborative effort was crucial in ensuring that the instrument accurately reflects local perceptions, particularly regarding dental aesthetics and traditional practices among Amharic-speaking schoolchildren in Ethiopia.

Psychometric evaluation

The psychometric evaluation of the adapted COHIP-SF 19 scale was conducted to assess its reliability and validity among Amharic-speaking schoolchildren. The internal consistency of the COHIP-SF 19 was evaluated using Cronbach's alpha. A value of 0.70 or higher was considered acceptable, indicating that the items within the scale reliably measure the same construct. To assess the stability of the scale over time, a subset of participants completed the COHIP-SF 19 twice, with a two-week interval between assessments. The intraclass correlation coefficient (ICC) was calculated to determine the consistency of scores across the two administrations. Convergent Validity and Discriminant Validity of the COHIP-SF 19 scale was assessed.

Data collection

Six health professionals participated in the data collection process. A one-day training was given to data collectors on the objective of the study and the details of the scale. Data privacy was upheld throughout all phases of the study. Participants were interviewed face to face in their classroom or around in a quiet room. The data were collected from March 1–15, 2024.

Clinical examination

Two dentists have been trained and calibrated to perform clinical dental examinations to diagnose dental caries. Before the primary study's data collection began, a different group of students underwent tests to determine the inter- and intra-examiner reliability. All participants underwent dental examinations in a separate room during the day while seated in a regular chair following the completion of the questionnaires. Dental caries was examined in accordance with the basic procedures of the WHO diagnostic criteria [27].

Data analysis

Different statistical analyses were carried out to determine the reliability of the COHIP-SF19 scales translated into Amharic. Cronbach's alpha was calculated for the total score of the scale and subscales to determine the internal consistency of the instrument. In addition, the test-retest was computed to evaluate the reliability and reproducibility of measures. The test-retest reliability was assessed using the intra-class correlation coefficient (ICC) and its 95% confidence interval. The internal consistency and test-retest reliability were considered acceptable when the values of Cronbach's alpha (>70) and ICC(>0.70) [28, 29].

The standard error of measurement (SEM agreement) was calculated to determine the reproducibility of the scale, using the formula $SEM = SD * (\sqrt{1 - ICC})$. The SEM was also converted into the smallest detectable change ($SDC = 1.96 X \sqrt{2 X SEM}$), which reflects the smallest within-person change in score. With a P < 0.05, this can be interpreted as a "real" change, above measurement error, in one individual (SDCind). The Smallest Detectable Change (SDC) is measurable in a group of people (SDC group) can be calculated by dividing the SDCind by \sqrt{n} Values above the SDC describe a change in the individual's score above the error of the measurement [30, 31].

Floor and ceiling effects were also calculated. Floor and ceiling effects are considered present if more than 15% of the respondents achieved the lowest or highest possible score on the scale [31–33]. Finally, Confirmatory Factor Analysis with the maximum likelihood estimation was performed to examine the dimensionality and construct validity of the three-factor structure of the COHIP-SF19 [12].

To evaluate discriminant validity, we applied the Fornell and Larcker criterion [34] by comparing the square root of the Average Variance Extracted (AVE) for each factor with the correlation coefficients among factors. Model fit was assessed using several indices: a χ^2 /df ratio of less than 5, GFI and AGFI values of 0.80 or higher, a CFI of 0.90 or more, and an RMSEA between 0.05 and 0.08. Convergent validity was confirmed with Composite Reliability (CR) values of 0.70 or higher and AVE values of 0.50 or more [35].

Ethics statement

This study was approved by the University of Gondar, College of Medicine and Health Sciences and Specialized Hospital, Institutional Review Board (IRB) with reference number (R/T/T/C/Eng./ 151/18/2023). Before data

collection, the nature, objectives, and confidentiality of the data were explained to each participant. Participation was voluntary, and written informed consent was obtained from each participant's parent, with assent from each schoolchild.

Results

Translation process

The translation team comprised diverse experts, including a Health Education specialist (MPH, 10 + years' experience), four Language experts (MEd in TEFL, 10 + years), four Dental Medicine doctors (DDM, 4 + years), a Public Health expert (PhD, 10 + years), and a Reproductive Health specialist (PhD, 10 + years). The process began with forward translation by a dentist and language expert, reviewed and merged by a committee of dentists, language experts, and public health researchers. Backward translation was performed by another dentist and language expert, followed by expert panel review to ensure a rigorous, culturally appropriate adaptation.

Semantic equivalence

Slight modifications were made to the initial version of the back-translated English version of the scale. For example, for item number 1, originally said, "Had pain in your teeth." Interpreter 1 translated this as "Have you experienced a toothache." Interpreter 2 translated it, as "Had a toothache." Based on this we have selected the later translation. Similarly for item number 9, "Had difficulty keeping your teeth clean." Interpreter 1, translated this as "Do you face difficulty to keep your teeth clean." Interpreter 2 translated this as "Had difficulty cleaning your teeth properly" We have selected interpreter 2's translation by avoiding "properly" at the end of the translated statement. No changes in the response options or the questionnaire format or mode of administration were suggested.

Socio-demographic characteristics of the study participants

Four Hundred schoolchildren were participated, 51.5% (206) female, with an average age of (13.33 ± 0.97) years. 29% (116) schoolchildren were grade six, 34% (136) were grade seven and the rest 37% (148) of them were grade eight. 83% of schoolchildren were (320) reside in urban (Table 1).

Descriptive statistics for COHIP-SF 19

The overall mean score for the COHIP-SF19 scale was 52.55 (\pm 11.47 SD). The mean scores for the socio-emotional, oral health, and functional subscales were 29.35 (\pm 7.765), 13.21 (\pm 3.99), and 9.99 (\pm 3.29), respectively.

Variables		Frequency	Percent
Sex	Male	194	48.5
	Female	206	51.5
Age (years)	12-14	356	89
	15-17	44	11
Grade level	6th	116	29
	7th	136	34
	8th	148	37
Residence	Urban	320	82.5
	Rural	70	17.5

Table 2 Reliability measures for COHIP-SF19 scale and its subscale among schoolchildren in Northwest Ethiopia 2024 (n = 400)

Subscales	No. of items	Cronbach's alpha		
Oral health well-being	5	0.86		
Functional well-being	4	0.80		
Socio-emotional well-being	10	0.93		
Overall scale	19	0.90		

Factor analysis

The model explained 63.4% of the of the data variance. The factor load factor matrix after Varimax rotation all points belong to their scales with loads: 0.57–0.85. The result of composite reliability (CR) for the socio-emotional, oral health, and functional subscales were 0.928, 0.861, and 0.804, respectively.

Internal consistency

The COHIP-SF 19 scale exhibited strong internal consistency, with a Cronbach's alpha of 0.901. Internal consistency for the subscales ranged from 00.795 to 0.929 (Table 2).

Reliability and agreement (Reproducibility)

The total score of the COHIP-SF 19 scale demonstrated excellent agreement, with an intraclass correlation coefficient (ICC) of 0.89 (95% CI = 0.84–0.93). ICC values for the subscales ranged from 0.58 to 0.92, indicating varying levels of reliability. The standard error of measurement was 2.124, representing 2.8% of the total score range. Additionally, the smallest detectable change (SDC) was calculated at 19.5, with a group SDC of 1.95 (Table 3).

Construct validity (convergent and discriminant validity)

The convergent validity of the COHIP-SF19 was evaluated using self-perceived oral health among schoolchildren, The mean rating for self-perceived oral health was 3.03 (±1.22 SD). Spearman correlations between the total COHIP-SF19 score and the three subscale scores with perceived oral health ratings were significant for all pairs (P<0.001), with positive coefficients ranging from rs = 0.445 to 0.710. The overall COHIP-SF19 score correlated strongly with self-assessed oral health (r=0.710). The subscale correlations were(r=0.493, 0.445 and 0.653) for oral health, functional add socio-emotional wellbeing respectively. These findings provide evidence of convergent validity.

Discriminant validity was assessed using the Mann-Whitney U test after normality tests indicated significant deviations (Kolmogorov-Smirnov: 0.101, p < 0.001; Shapiro-Wilk: 0.954, p < 0.001). We compared the results obtained with COHIP-SF 19 and its subscales to dental clinical outcomes (dental caries). Children without dental caries had a significantly higher overall score (Z = -13.81, p < 0.001), with an effect size of $r \approx 0.540$. For the functional subscale, the Z score was -8.57 (p < 0.001), with an effect size of $r \approx 0.524$. The oral health subscale had a Z score of -9.56 (p < 0.001), resulting in an effect size of $r \approx 0.528$. Lastly, the socio-emotional well-being subscale showed a Z score of -12.77 (p < 0.001), with an effect size of $r \approx 0.537$. These findings demonstrate that the overall COHIP-SF 19 scale and its subscales effectively differentiate between schoolchildren with and without dental caries, supporting its discriminant validity.

Construct validity was assessed by examining discriminant and convergent validity [12]. The AVE for the Socio-Emotional (0.57), Oral Health (0.556), and Functional Wellbeing (0.51). The composite reliability for these factors ranged from 0.80 to 0.93. Discriminant validity was assured by using Fornell and Lacker in 1981 [34] by comparing the square root of each AVE from the diagonal with the correlation coefficients (off-diagonal) for each factor in the relevant rows and columns (Table 4).

Confirmatory factor analysis

Confirmatory factor analysis (CFA) was computed using AMOS version 23 to test the measurement models. As

Table 3 Reliability and agreement measures for the COHIP-SF19 scale and its subscales among schoolchildren in Northwest Ethiopia 2024 (*n* = 400)

Subscales	Test scores	Retest scores	⁻d	ICC (95% CI)	SDdiff	SEM	SDCind	SDCgroup	95% LoA
Oral Health	12.09±4.194	12.09±4.194	0.110	0.871 (0.808, 0.913)	2.722	0.978	2.711	0.211	-5.225; 5.445
Functional	7.310 ± 2.071	8.420 ± 2.170	-1.11	0.576 (0.310, 0.731)	2.210	1.367	3.789	0.379	-6.422; 4.202
Socio-Emotional	25.710±8.171	25.320 ± 7.660	0.390	0.918 (0.901, 0.932)	4.074	1.167	3.224	0.322	-7.595;8.375
Overall score	45.110±10.424	45.720±10.492	-0.610	0.893(0.842, 0.928)	6.493	2.124	19.5	1.95	-13.336;12.116

ICC = intraclass correlation coefficient; "d = mean difference score; CI = confidence interval; SDdiff = standard deviation of difference scores; SEM = standard error of measurement; SDCind = smallest detectable change for individual subject; SDCgroup = smallest detectable change for group; LoA = limits of agreement

Table 4 Construct validity (convergent and discriminant validity) of COHIP-SF19 scale among schoolchildren Northwest Ethiopia 2024 (n = 400)

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	CR	AVE	MSV	MaxR(H)	Socio-Emotional	Oral Health	Functional
Socio-Emotional	0.928	0.570	0.239	0.941	0.755		
Oral Health	0.861	0.556	0.138	0.876	0.266***	0.746	
Functional	0.804	0.510	0.239	0.828	0.488***	0.371***	0.714

part of CFA, factor loadings were assessed for each item. The model fit measures were used to evaluate the overall adequacy of the model fit, including (CMIN/df, GFI, CFI, TLI, SRMR, and RMSEA). We utilized Modification Indices to assess potential improvements in model fit as it has seen in (Fig. 1). This approach allowed us to identify specific adjustments, such as correlating error terms between items that shared conceptual similarities, thereby enhancing the model's explanatory power (The fit values of the three-factor (Socio Emotional, Oral health and Functional wellbeing) model, which is identical to the original COHIP-SF 19, satisfied the acceptable fit criterion. Inter-factor correlation coefficients showed relatively higher correlations, ranging from 0.68 to 0.84 (Fig. 1). All the items had factor loadings of > 0.5. This three factor structure model good fit indices in RMSEA = 0.05, GFI = 0.93, and AGFI = 0.90 as that of the original model [36] (Table 5).

The results of the CFA indicated good model fit for both male and female groups in the configural invariance model (CMIN(chi square)/DF = 2.5,, GFI = 0.93, and AGF I = 0.84, CFI = 0.90, TLI = 0.88, and RMSEA = 0.06) suggesting that the COHIP-SF 19 functions similarly across genders. For the metric invariance, the chi-square difference test revealed no significant difference between the unconstrained and constrained models of measurement weights (p = 0.120), indicating that the factor loadings are equivalent across genders.

Floor and ceiling effects

There were no floor and ceiling effects (0) for the overall scale. For the subscales, the highest core was found in oral health (9.5%), followed by Socio emotional (5.25%) and functional well-being (2.75%). On the other hand, the numbers of those who achieved the lowest possible score were generally (0) low in all subscales.

Discussion

To evaluate quality of life, any assessment tool must be validated in the participants' language. Our findings demonstrate that the scale is highly reliable, with robust internal consistency and a strong intraclass correlation. The precision of the measurement is underscored by a standard error of measurement that constitutes a small percentage of the total score range. Furthermore, the observed correlation between COHIP-SF 19 scores and self-reported oral health illustrates its convergent validity, schoolchildren without dental caries scored significantly higher, confirming the scale's discriminant validity while schoolchildren without dental caries scored significantly higher, confirming the scale's discriminant validity.

This study demonstrated excellent internal reliability for the COHIP-SF 19, with a Cronbach's alpha exceeding the acceptable threshold of 0.7 [36] aligning with the original scale [12], Chinese [19], and German [20] versions. The Cronbach's alpha values for the subscales varied: the oral health (0.86) and functional well-being (0.79) subscales had lower values compared to the socioemotional well-being subscale (0.92). This discrepancy may be attributed to the small number of items in the oral health (5 items) and functional well-being (4 items) subscales. The subscale reliabilities exceeded those found in the Chinese [19] and Arabic [37] versions indicating internal consistency and confirming that they are within an acceptable range. This suggests the scale is suitable for diverse cultural contexts.

The COHIP-SF 19 AM demonstrated excellent testretest reliability (ICC=0.89), exceeding the 0.70 threshold [38]. and comparable to the Japanese version (ICC = 0.81) [21]. It also exceeded the reliability of Arabic (0.76) and Chinese (0.77) versions [19, 24]. The testretest reliability of the functional well-being subscale (ICC = 0.576) indicates moderate reliability due to factors such as daily changes in physical health, emotional state, and environmental conditions. Context-sensitive items may fluctuate based on current circumstances, while the limited number of items may restrict its ability to capture the full range of experiences. This suggests cautious interpretation of results, as scores may not accurately reflect true functional well-being. Incorporating higherreliability subscales (e.g., oral health and socioemotional) could enhance the overall understanding of health status. The standard error of measurement was 2.12, well below the 5% threshold, confirming strong agreement and responsiveness of the scale. These findings imply that the COHIP-SF 19 AM is a reliable tool for assessing oral health-related quality of life across different cultural contexts, enhancing its utility in diverse populations.

The Confirmatory Factor Analysis (CFA) of the COHIP-SF19 revealed that the three-factor model, consistent with the original COHIP-SF19 structure, showed acceptable fit values, aligning with previous research [36]. Satisfactory factor loadings for all items demonstrated that each item adequately represented its corresponding



Fig. 1 Measurment model of COHIP-SF 19 and its result

factor. Overall test statistics and descriptive fit measures confirmed the model's good fit to the data, suggesting that the COHIP-SF 19 is valid and reliable for measuring oral health-related quality of life in schoolchildren. Furthermore, the findings of configural and metric invariance indicate that the COHIP-SF 19 is a reliable tool for assessing oral health-related quality of life across genders. The configural invariance model demonstrates a consistent underlying structure for both groups. The non-significant difference in the metric invariance analysis (p = 0.120) confirms comparable factor loadings, facilitating meaningful comparisons between male and female respondents. These results highlight the COHIP-SF 19's applicability in diverse populations, supporting its effective use in clinical and research settings without gender bias. Overall, these findings reinforce the utility of the

Table 5 Measurement model fit indices of the confirmatory factor analysis for the COHIP-SF19 among schoolchildren in Northwest Ethiopia 2024 (n = 400)

Fit indices	Recom- mended values	Ob- tained value
CMIN(chi square) P value	Insignificant	Significant
CMIN(chi square)/DF	3–5	2.23
Goodness fit index(GFI)	> 0.90	0.93
Comparative fit index(CFI)	> 0.90	0.96
Tucker-Lewis Index(TLI)	> 0.90	0.95
Standardized Root Mean Square Residual(SRMR)	< 0.08	0.07
Root Mean Squared Error of Approximation(RMSEA)	< 0.08	0.06
Standardized root mean square residual (SRMR)	0–1	053

COHIP-SF 19 as a robust tool for assessing schoolchildren's oral health and well-being.

The COHIP-SF19's convergent validity was assessed using Spearman correlation analysis, revealing a statistically significant correlation with perceived oral health, indicating that schoolchildren who perceived their oral health to be better had higher scores on the COHIP-SF19, reflecting better oral health related quality of life. This supports the scale's ability to capture children's subjective experiences of oral health, consistent with study in Ukraine [39].

Discriminant validity of the scale was evaluated using the Mann-Whitney U test to compare scores of schoolchildren with and without dental caries. The result showed a significant difference, with children without caries scoring higher, confirming the scale's effectiveness in assessing the impact of dental caries on oral healthrelated quality of life. These findings indicate the scales utility in clinical practice and research for evaluating both subjective and objective aspects of children's oral health and guiding targeted interventions. Discriminant validity was also confirmed using the Fornell and Larcker criterion [34], showing that the square root of each AVE exceeded the correlation coefficients between factors, indicating distinct subscales. This supports the scale's effectiveness in measuring its intended constructs and ensuring factor distinctiveness, with significant implications for measuring oral health-related quality of life.

The validated COHIP-SF19 has significant implications for policymakers, educators, dental professionals and public health research in Ethiopia to enhance children's oral health outcomes. Policymakers can leverage the tool to gather data on oral health-related quality of life, informing targeted public health initiatives and resource allocation. Educators can integrate findings into school curricula to promote awareness and preventive care among students and parents. Meanwhile, dental professionals can use the COHIP-SF19 as a clinical assessment tool to understand their young patients' experiences and tailor treatment plans that address both dental and psychosocial needs. This collaborative approach across sectors can significantly improve children's oral health outcomes and overall well-being in the community. This validated scale will help researchers gather comparable data, enhancing understanding of OHRQoL across diverse cultural contexts and supporting evidencebased interventions. However, socioeconomic context may significantly influences children's perceptions of oral health and their responses to the COHIP-SF 19. Limited access to dental care and lower parental education can lead to negative perceptions and reduced understanding of oral hygiene. These factors may introduce biases, impacting the instrument's external validity.

This study had limitations, including the lack of a third translator during the translation process. Ideally, an independent translator would have improved the tool's validity and reliability, but we relied on an expert committee for review. Potential sampling biases may arise from the face-to-face interview setting in school environments, where children may alter their responses due to social desirability or peer influence. Recognizing these influences is essential for accurately interpreting our findings and understanding the COHIP-SF 19's implications among diverse populations in Ethiopia.

Conclusion and recommendation

In this study, the Amharic version of the COHIP-SF 19 was developed using a standardized procedure for cross-cultural adaptation, ensuring its relevance in the Ethiopian context. Psychometric evaluation confirmed its internal reliability, test-retest reliability, discriminant validity, and convergent validity among schoolchildren.

This validated tool can be used in clinical practice, service evaluation, and research to assess oral health-related quality of life (OHRQoL) in Amharic-speaking children. Importantly, it can support policy-making and targeted interventions to improve children's oral health in Ethiopia. Longitudinal research to assess responsiveness to changes in oral health would be beneficial.

Abbreviations

AVE	Average Variance Extracted
CFA	Confirmatory Factor Analysis
COHIP-SF19	Child Oral Health Impact Profile Short Form 19
CR	Composite Reliability
OHRQoL	Oral Health Related Quality of Life
SEM	Standard Error of Measurement
SD	Standard Deviation
SDC	Smallest Detectable Change
WHO	World Health Organization

Supplementary Information

The online version contains supplementary material available at https://doi.or g/10.1186/s12903-025-06230-9.

Supplementary Material 1
Supplementary Material 2

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Author contributions

YT, KA, AAM, and AT conceived the idea. YT, KA, AAM, AT, and AA conducted the design. All the authors participated in the analysis process. YT wrote the first draft of the manuscript. All authors did write review and editing. All authors have read and agreed to the final version of the manuscript.

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Data availability

The data that support the findings of this study are not openly available as they are part of the PhD training. However, they can be obtained from the corresponding author upon reasonable request.

Declarations

Ethics approval and consent to participate

The study was conducted in accordance with the ethical principles outlined in the Declaration of Helsinki. The Institutional Review Board of University of Gondar, Collage of Medicine and Health Sciences, and Specialized Hospital ethically approved this study with reference number (R/T/T/C/ Eng./ 151/18/2023) Gondar, Ethiopia. A permission letter was sought from the Amhara Public Health Institute. Signed informed consent was obtained from the schoolchildren's parents (mother or father) before one week the start of the interview. A letter attached with consent forms that explained the study objective was sent for parents. Assent was also obtained from each schoolchildren. The anonymity of the participants and confidentiality of the data was maintained.

Consent for publication

Not Applicable.

Competing interests

The authors declare no competing interests.

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