BJOS
Brazilian Journal of Oral Sciences

Original Research

Volume 25
2026
e268908

Validation of an instrument that assesses the quality of care in dental services from the perspective of adolescents

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Editor: Dr. Altair A. Del Bel Cury

Received: January 10, 2025
Accepted: May 22, 2025

Aim: To characterize the quality of dental care services and validate the Quality of Care in Dental Services from the Perspective of Adolescents (QASO-A - Qualidade da Assistência nos Serviços Odontológicos na perspectiva de Adolescentes) instrument. **Methods:** A quantitative cross-sectional epidemiological study, part of an epidemiological survey on oral health conditions among schoolchildren. The tested sample consisted of 350 subjects. Trained academics used software developed for data collection and database construction. Data were descriptively analyzed using JASP 1.8.2. **Results:** The quality of dental care was positively evaluated among schoolchildren aged 12 and 15 years. However, there was limited access to information about oral cancer and diet, along with dissatisfaction related to the physical structure of the clinic, the comfort of the dental chair, and waiting time. The QASO-A instrument provided evidence of validity and reliability. **Conclusion:** The quality of dental care among adolescents aged 12 and 15 years was well evaluated in terms of service satisfaction, indicating that good-quality services were offered. The QASO-A instrument was considered valid and reliable for application to individuals with similar characteristics to those evaluated in this study.

Keywords: Health services research. Dentistry. Dental care. Oral health.

Introduction

Donabedian, an Armenian pediatrician who later settled in the USA, was the first to assess healthcare quality using theories originally applied in the industrial sector. He introduced the classic triad of quality indicators (structure, process, and outcome), adapting them to hospital care. Structure encompasses the physical, material, human, and financial resources essential for healthcare delivery. Process refers to the interaction between professionals and users during care, evaluated from both technical and administrative perspectives. Outcome reflects the impact of care on individuals and the population, considering health improvements, satisfaction with services, and the fulfillment of user expectations. This dimension of quality can be assessed through user satisfaction with the care provided[1].

In Brazil, access to healthcare is constitutionally guaranteed[2]. The 1988 Federal Constitution established health as a fundamental right, assigning the Unified Health System (Sistema Único de Saúde – SUS) the responsibility of ensuring this right for all citizens. Reinforcing this mandate, the Child and Adolescent Statute (Article 11) guarantees comprehensive healthcare for children and adolescents, to be provided through SUS, which oversees access to health promotion, protection, and recovery services[3,4]. Additionally, the Organic Health Law upholds universal and comprehensive access to healthcare as a fundamental principles, ensuring these rights for all Brazilian citizens[5,6].

Beyond benefiting individual health, access to and use of healthcare services also play a key role in evaluating service quality. By incorporating users' subjective perspectives alongside technical assessments, healthcare providers can refine management strategies and improve service delivery[7]. Studies on user satisfaction with dental services are integral to the development of SUS and the expansion of public dental care, fostering greater community involvement in designing and evaluating healthcare initiatives[7].

National surveys highlight a positive trend in user perception of public dental services[7-9]. In 2003, most users rated dental care as "good" or "very good," and this favorable evaluation was reaffirmed in 2010. The growing number of studies on this topic reflects an increasing awareness of the importance of assessing dental services from the users' perspective. Unlike purely technical evaluations, user-centered assessments enable the development of targeted actions that address real population health needs[9,10]. User satisfaction is a critical measure of healthcare quality and is directly linked to overall well-being, quality of life, and oral health. Consequently, assessing the quality of care in both medical and dental fields must be an ongoing effort[7,9]. Engaging adolescents and young people in their therapeutic planning fosters greater commitment to their health and enhances the effectiveness of healthcare teams.

A significant policy advancement in this regard is Ordinance GM/MS Nº. 960, issued on July 17, 2023, which introduced Performance-Based Payment for Oral Health in Primary Healthcare under SUS[11]. By monitoring key performance indicators, healthcare professionals and managers can evaluate service accessibility and quality, optimize

oral health strategies, and enhance transparency in health investments. Among these indicators, user satisfaction with oral health services is particularly emphasized[11].

Ensuring high-quality dental services is fundamental for health evaluation and strategic planning. Previous studies have examined user satisfaction with dental care among Brazilian adults, identifying greater dissatisfaction in areas with lower dentist-to-resident ratios[10]. However, no studies to date have explored the quality of these services from the perspective of adolescents. Therefore, the present study aims to assess the quality of dental care and validate the Quality of Care in Dental Services from the Perspective of Adolescents (QASO-A) instrument through Confirmatory Factor Analysis (CFA). By providing a validated tool to evaluate dental service quality from an adolescent perspective, this research contributes to evidence-based improvements in oral healthcare, ultimately enhancing service delivery for this population.

Methods

The study is an excerpt from the Epidemiological Survey on Oral Health Conditions Among Schoolchildren in Montes Claros, Minas Gerais, Brazil (SB Moc Project) and follows a quantitative cross-sectional epidemiological design. The population comprised schoolchildren from public schools in the urban area of Montes Claros, a medium-sized city with an estimated population of 413,487 inhabitants[12]. The study adhered to the 2013 methodological proposal of the World Health Organization (WHO)[13], which established standardized methodologies for epidemiological investigations on oral health conditions. The WHO has published five editions of methodological manuals, widely adopted in global research on oral health. The fifth edition, released in 2013, recommends assessing adolescents at two index ages (12 and 15 years) to represent this age group. Specifically, it defines the 12-year index age as including individuals aged 11 years and 6 months to 12 years and 6 months, and the 15-year index age as including those aged 14 years and 6 months to 15 years and 6 months[13].

Initially, a probabilistic cluster sampling method was designed to include all students aged 12 and 15 years enrolled in 2019 in private and public schools, covering municipal and state institutions in both urban and rural areas. The sample was stratified by age, ensuring representation of all adolescents in the municipality, as per WHO recommendations[13]. The sampling plan considered the following parameters: an eligible population of 5,539 students aged 12 and 5,228 students aged 15, an assumed prevalence of 50%, a 95% confidence level (Z = 1.96), a 5% sampling error, a 10% non-response rate, and a design effect (deff) of 1.4[14,15]. These criteria determined that a sample of 540 (3601.4 + 10%) and 537 (3581.4 + 10%) would be necessary. However, with the emergence of Severe Acute Respiratory Syndrome Coronavirus 2 (SARS-CoV-2), first identified in Wuhan, China, in December 2019[16], the resulting COVID-19 pandemic led to the suspension of data collection in public and private schools in rural areas and private schools in urban areas. As a result, a reevaluation of the sample calculation was necessary, restricting the study to municipal and state public schools in urban areas. The revised eligible population included 4,036 students aged 12 and 4,118 students aged 15, reducing the estimated sample size to 527 and 528 students, respectively. All students who met the recommended

index ages and were enrolled in the selected schools were invited to participate, with cognitive impairments preventing participation as an exclusion criterion.

The study was conducted using Research Management System software, developed by a specialized company to create two digital platforms: one for data collection and database construction, including interfaces for oral exams and interviews, and another for intra- and inter-examiner calibration estimation. The field research in this segment of the SB Moc Project relied on the interview interface for data collection, which was carried out by Dentistry students from partner institutions, who evaluated aspects related to dental care quality in public health services. The study received approval from the National Research Ethics Committee of the State University of Montes Claros (Unimontes - Opinion No. 2,483,638).

Statistical Analysis

The descriptive statistical analysis aimed to organize, summarize, and present the data through text and tables, characterizing the QASO-A. Response frequencies for each category of the items in the satisfaction and evaluation dimensions were estimated. The instrument's validation was performed using Confirmatory Factor Analysis (CFA) to assess whether it appropriately reflected two latent dimensions, Evaluation and Satisfaction, which together comprised the latent construct QASO-A. The estimation method employed was Robust Diagonally Weighted Least Squares (RDWLS), suitable for categorical data[17,18].

To evaluate the model fit, several indices were considered: χ^2, χ^2/gl, Comparative Fit Index (CFI), Tucker-Lewis Index (TLI), Standardized Root Mean Square Residual (SRMR), and Root Mean Square Error of Approximation (RMSEA). For model validity, χ^2 values should ideally not be statistically significant, the χ^2/gl ratio should be below 5 (preferably under 3) while CFI and TLI should exceed 0.90, ideally surpassing 0.95. Additionally, RMSEA values should be below 0.08 or, preferably, under 0.06, with an upper confidence interval limit below 0.10[19]. The modification index was examined to check for cross-loadings among items. Furthermore, floor and ceiling effects were analyzed by determining the proportion of individuals who selected the lowest or highest possible scores, with good-quality samples recommended not to exceed 40% of responses in extreme categories, as supported by multiple authors[20,21]. The overall data quality assessment considered response frequency distributions, missing data, and descriptive statistics.

Following the factorial model evaluation, reliability analysis of the dimensions was conducted using internal consistency reliability, measured through composite reliability based on standardized factor loadings from the CFA. A composite reliability above 0.70 was deemed desirable[22,23]. After validation, the scores for the two QASO-A dimensions were computed using the weighted additive method, which involved summing the products of item scores and their respective factor loadings from the CFA. The total instrument score was obtained by summing the products of dimension scores and their factor loadings[20].

Subsequently, Welch's t-tests were used to compare scores across biological sexes, age groups (12 and 15 years), and school types (municipal and state). Analysis of vari-

ance (ANOVA) was applied to assess differences in self-reported race or color. To further analyze significant differences in ANOVA, the Sidak post-hoc test was performed. Both tests used bootstrap resampling with 1,000 iterations to mitigate the potential effects of non-normal data distribution[24]. Subgroups were categorized according to sociodemographic characteristics such as age and education level, and effect size measures were calculated to determine the magnitude of significant differences.

For Welch's t-test, Cohen's d was applied, with values classified as insignificant (<0.20), small (0.21–0.39), moderate (0.40–0.79), and large (≥0.80)[25,26]. In ANOVA, η^2 (eta-squared) was used as an effect size measure, where values below 0.01 were insignificant, between 0.01 and 0.04 were small, from 0.05 to 0.11 were medium, and above 0.14 were large[26,27]. All statistical analyses were conducted using JASP 1.8.2, an open-source statistical software[28]. A significance level of $p < 0.05$ was adopted throughout the study.

Results

A total of 708 subjects were initially selected for the study. However, to ensure validation without the need for imputation techniques for missing responses, individuals who answered "I have never been to the dental office" and those who did not fully complete the QASO-A were excluded. As a result, 358 subjects were removed, leaving a final sample of 350 participants. The majority were female (54.86%), self-identified as mixed-race (59.71%), attended state schools (63.14%), and were 15 years old. The response frequencies for each category of the items in the satisfaction and evaluation dimensions are detailed in Tables 1 and 2.

Table 1. Response frequencies in each category of the satisfaction dimension items among adolescents aged 12 to 15 years, from Montes Claros - MG, 2019/2020.

Evaluation items	Age					
	12		15		Todos	
	n	%	n	%	n	%
1. During your last visit to a dentist in general, how SATISFIED were you with the ASSISTANCE provided?						
Very satisfied	72	75.00	157	61.81	229	65.43
Partially satisfied	16	16.67	74	29.13	90	25.71
Neither dissatisfied nor satisfied	6	6.25	18	7.09	24	6.86
Partially dissatisfied	1	1.04	3	1.18	4	1.14
Very dissatisfied	1	1.04	2	0.79	3	0.86
2. During your last appointment with a general dentist, how would you rate your SATISFACTION regarding the FREEDOM you or your family had TO CHOOSE THE DENTIST?						
Very satisfied	63	65.63	140	55.12	203	58.00
Partially satisfied	24	25.00	81	31.89	105	30.00
Neither dissatisfied nor satisfied	7	7.29	21	8.27	28	8.00
Partially dissatisfied	1	1.04	7	2.76	8	2.29
Very dissatisfied	1	1.04	5	1.97	6	1.71

Continue

Continuation

3. During your last appointment with a general dentist, how would you RATE THE TRAVEL TIME OR DISTANCE to reach the dental office?						
Excellent	39	40.63	91	35.83	130	37.14
Good	44	45.83	109	42.91	153	43.71
Regular	12	12.50	43	16.93	55	15.71
Bad	1	1.04	7	2.76	8	2.29
Terrible	0	0.00	4	1.57	4	1.14
4. During your last appointment with a general dentist, in your opinion, WERE THE ACCESSIBILITY FEATURES, such as the quality of the ramp, elevator, doors, and/or stairs, ADEQUATE to reach the dental office?						
Very suitable	31	32.29	96	37.80	127	36.29
Adequate	54	56.25	126	49.61	180	51.43
Neither suitable nor unsuitable	7	7.29	15	5.91	22	6.29
Inappropriate	3	3.13	14	5.51	17	4.86
Very Inappropriate	1	1.04	3	1.18	4	1.14
5. During your last appointment with a general dentist, how satisfied were you with the PHYSICAL STRUCTURE OF THE DENTAL OFFICE where you were treated?						
Very dissatisfied	43	44.79	99	38.98	142	40.57
Partially dissatisfied	12	12.50	55	21.65	67	19.14
Neither dissatisfied nor satisfied	9	9.38	23	9.06	32	9.14
Partially satisfied	4	4.17	24	9.45	28	8.00
Very satisfied	28	29.17	53	20.87	81	23.14
6. During your last appointment with a general dentist, was the WAITING ROOM SPACE ADEQUATE?						
Very suitable	36	37.50	97	38.19	133	38.00
Adequate	46	47.92	125	49.21	171	48.86
Neither suitable nor unsuitable	6	6.25	15	5.91	21	6.00
Inappropriate	7	7.29	13	5.12	20	5.71
Very Inappropriate	1	1.04	4	1.57	5	1.43
7. During your last appointment with a general dentist, was the DENTAL CHAIR COMFORTABLE?						
Very uncomfortable	35	36.46	92	36.22	127	36.29
Uncomfortable	40	41.67	114	44.88	154	44.00
Neither uncomfortable nor comfortable	8	8.33	18	7.09	26	7.43
Comfortable	2	2.08	6	2.36	8	2.29
Very comfortable	11	11.46	24	9.45	35	10.00
8. During your last appointment with a general dentist, in your opinion, were the MATERIAL(S) OR EQUIPMENT(S) used by the dentist ADEQUATE for your treatment?						
Very suitable	58	60.42	148	58.27	206	58.86
Adequate	33	34.38	103	40.55	136	38.86
Neither suitable nor unsuitable	2	2.08	2	0.79	4	1.14
Inappropriate	3	3.13	1	0.39	4	1.14

Continue

Continuation

9. During your last appointment with a general dentist, how satisfied were you with the way the DENTAL APPOINTMENT(S) WERE SCHEDULED?						
Very satisfied	52	54.17	132	51.97	184	52.57
Partially satisfied	28	29.17	93	36.61	121	34.57
Neither dissatisfied nor satisfied	10	10.42	12	4.72	22	6.29
Partially dissatisfied	5	5.21	14	5.51	19	5.43
Very dissatisfied	1	1.04	3	1.18	4	1.14

Table 2. Frequency of responses in each category of the items in the evaluation dimension among adolescents aged 12 to 15, from Montes Claros - MG, 2019/2020.

Evaluation items	Age					
	12		15		Todos	
	n	%	n	%	n	%
10. During your last appointment with a general dentist, how SATISFIED were you with the WAITING TIME TO ENTER THE DENTAL OFFICE after the initial reception?						
Very dissatisfied	310	32.29	80	31.50	111	31.71
Partially dissatisfied	240	25.00	74	29.13	98	28.00
Neither dissatisfied nor satisfied	110	11.46	22	8.66	33	9.43
Partially satisfied	80	8.33	40	15.75	48	13.71
Very satisfied	22	22.92	38	14.96	60	17.14
11. During your last appointment with a general dentist, was the CLEANLINESS of the office SATISFACTORY?						
Very satisfied	73	76.04	190	74.80	263	75.14
Partially satisfied	19	19.79	53	20.87	72	20.57
Neither dissatisfied nor satisfied	3	3.13	5	1.97	8	2.29
Partially dissatisfied	0	0.00	4	1.57	4	1.14
Very dissatisfied	1	1.04	2	0.79	3	0.86
12. During your last appointment with a general dentist, was the CLEANLINESS OF the brushing station SATISFACTORY?						
Very satisfied	61	63.54	129	50.79	190	54.29
Partially satisfied	17	17.71	50	19.69	67	19.14
Neither dissatisfied nor satisfied	5	5.21	4	1.57	9	2.57
Partially dissatisfied	0	0.00	6	2.36	6	1.71
Very dissatisfied	1	1.04	1	0.39	2	0.57
The office or clinic did not have a toothbrush or sink to brush your teeth.	12	12.50	64	25.20	76	21.71
13. During your last appointment with a general dentist, do you consider the RESPECTFUL manner in which you were treated by this professional ADEQUATE?						
Very suitable	70	72.92	187	73.62	257	73.43
Adequate	24	25.00	60	23.62	84	24.00
Neither suitable nor unsuitable	2	2.08	4	1.57	6	1.71

Continue

Continuation

Inappropriate	0	0.00	2	0.79	2	0.57
Very Inappropriate	0	0.00	1	0.39	1	0.29
14. During your last appointment with a general dentist, in your opinion, was the DENTIST'S MANUAL DEXTERITY OR TECHNICAL COMPETENCE ADEQUATE for your treatment?						
Very suitable	55	57.29	146	57.48	201	57.43
Adequate	32	33.33	92	36.22	124	35.43
Neither suitable nor unsuitable	6	6.25	10	3.94	16	4.57
Inappropriate	2	2.08	5	1.97	7	2.00
Very Inappropriate	1	1.04	1	0.39	2	0.57
15. During your last appointment with a general dentist, how would you ASSESS the experience of BEING INVOLVED IN THE DECISION-MAKING regarding your dental care or treatment?						
Excellent	370	38.54	103	40.55	140	40.00
Good	38	39.58	97	38.19	135	38.57
Regular	14	14.58	35	13.78	49	14.00
Bad	1	1.04	2	0.79	30	0.86
Terrible	1	1.04	0	0.00	1	0.29
I was not involved in decision-making about my treatment	5	5.21	17	6.69	22	6.29
16. During your last appointment with a general dentist, how would you ASSESS the CLARITY with which the dentist explained the issues related to your dental treatment?						
Excellent	48	50.00	116	45.67	164	46.86
Good	35	36.46	105	41.34	140	40.00
Regular	8	8.33	25	9.84	33	9.43
Bad	3	3.13	3	1.18	6	1.71
Terrible	1	1.04	1	0.39	2	0.57
The dentist did not give any explanations	1	1.04	4	1.57	5	1.43
17. During your last appointment with a general dentist, was the TIME TO ASK QUESTIONS about your dental issue or treatment SUFFICIENT?						
Very sufficient	31	32.29	69	27.17	100	28.57
Enough	51	53.13	147	57.87	198	56.57
Neither enough nor insufficient	1	1.04	13	5.12	14	4.00
Insufficient	7	7.29	13	5.12	200	5.71
Very Insufficient	0	0.00	3	1.18	3	0.86
We didn't talk about my dental problem or treatment.	6	6.25	9	3.54	15	4.29
18. During your last appointment with a general dentist, how would you ASSESS the respect for YOUR PRIVACY DURING EXAMS AND TREATMENTS with this professional?						
Excellent	52	54.17	145	57.09	197	56.29
Good	37	38.54	96	37.80	133	38.00
Regular	7	7.29	10	3.94	17	4.86
Bad	0	0.00	2	0.79	2	0.57
Terrible	0	0.00	1	0.39	1	0.29

Continue

Continuation

19. During your last appointment with a general dentist, how would you ASSESS your PRIVACY in being able to speak privately with this professional?						
Excellent	35	36.46	121	47.64	156	44.57
Good	45	46.88	98	38.58	143	40.86
Regular	12	12.50	22	8.66	34	9.71
Bad	1	1.04	5	1.97	6	1.71
Terrible	0	0.00	2	0.79	2	0.57
I didn't have the opportunity to speak to the dentist	3	3.13	6	2.36	9	2.57
20. During your last appointment with a general dentist, how would you ASSESS WHAT YOU LEARNED from this professional?						
Excellent	36	37.50	68	26.77	104	29.71
Good	42	43.75	109	42.91	151	43.14
Regular	10	10.42	43	16.93	53	15.14
Bad	2	2.08	10	3.94	12	3.43
I didn't learn anything	6	6.25	24	9.45	30	8.57
21. During your last appointment with a general dentist, in your opinion, was the INFORMATION RECEIVED ABOUT HOW TO AVOID DENTAL PROBLEMS ADEQUATE for your treatment?"						
Very suitable	37	38.54	99	38.98	136	38.86
Adequate	52	54.17	132	51.97	184	52.57
Neither suitable nor unsuitable	1	1.04	3	1.18	4	1.14
Inappropriate	3	3.13	1	0.39	4	1.14
Very Inappropriate	1	1.04	0	0.00	1	0.29
I have not received information on how to avoid oral problems	2	2.08	19	7.48	21	6.00
22. During your last appointment with a general dentist, in your opinion, was the INFORMATION received about ORAL HYGIENE, such as TEETH CLEANING, use of DENTAL FLOSS, or use of MOUTHWASH, among other guidance, ADEQUATE?						
Very suitable	49	51.04	116	45.67	165	47.14
Adequate	36	37.50	114	44.88	150	42.86
Neither suitable nor unsuitable	4	4.17	9	3.54	13	3.71
Inappropriate	1	1.04	4	1.57	5	1.43
Very Inappropriate	1	1.04	0	0.00	1	0.29
Não recebi informações sobre higiene bucal	5	5.21	11	4.33	16	4.57
23. During your last appointment with a general dentist, in your opinion, was the INFORMATION ABOUT DIET/FOOD ADEQUATE for your treatment?						
Very suitable	26	27.08	35	13.78	61	17.43
Adequate	25	26.04	93	36.61	118	33.71
Neither suitable nor unsuitable	5	5.21	12	4.72	17	4.86
Inappropriate	4	4.17	12	4.72	16	4.57
Very Inappropriate	1	1.04	0	0.00	1	0.29
I did not receive any information about diet/nutrition	35	36.46	102	40.16	137	39.14

Continue

Continuation

24. During your last appointment with a general dentist, in your opinion, was the INFORMATION RECEIVED ABOUT HOW TO AVOID ORAL CANCER ADEQUATE?"						
Very suitable	8	8.33	15	5.91	23	6.57
Adequate	21	21.88	49	19.29	70	20.00
Neither suitable nor unsuitable	5	5.21	3	1.18	8	2.29
Inappropriate	4	4.17	11	4.33	15	4.29
Very Inappropriate	3	3.13	8	3.15	11	3.14
I have not received information on how to prevent mouth cancer.	55	57.29	168	66.14	223	63.71
25. During your last appointment with a general dentist, in your opinion, was the INFORMATION RECEIVED ABOUT HOW TO PERFORM AN ORAL SELF-EXAM ADEQUATE?						
Very suitable	11	11.46	24	9.45	35	10.00
Adequate	34	35.42	76	29.92	110	31.43
Neither suitable nor unsuitable	3	3.13	9	3.54	12	3.43
Inappropriate	3	3.13	6	2.36	9	2.57
Very Inappropriate	2	2.08	1	0.39	3	0.86
I have not received information about performing a self-examination of the mouth	43	44.79	138	54.33	181	51.71

The descriptive statistics of the QASO-A scores are presented in Table 3.

Table 3. Descriptive statistics of the scores from the instrument that aims to estimate the Quality of Care in Dental Services from the perspective of Adolescents, QASO-A, applied among students aged 12 to 15, from Montes Claros - MG, 2019/2020.

Statistic	Scales		Total
	Assessment	Satisfaction	QASO-A
Mean	7.41	16.62	22.19
I.C. 95% Upper limit	7.63	17.11	22.76
I.C. 95% Lower Limit	7.20	16.15	21.66
Standard Deviation	2.00	4.38	5.31
Minimum	4.29	8.05	12.71
Maximum	17.36	35.41	46.15
25º. percentile	5.98	13.72	18.60
75º. percentile	8.47	18.63	25.16

Legend: C.I. 95% - Confidence interval of the mean.

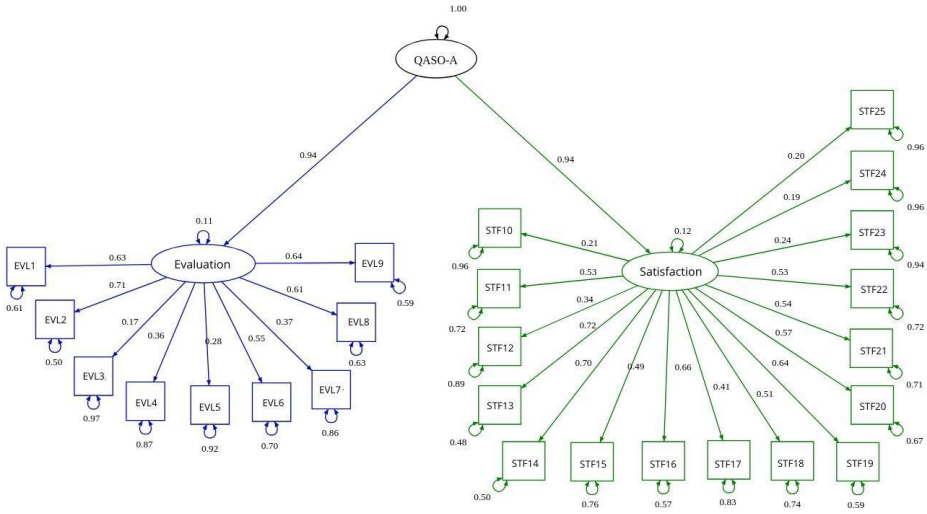
The structural analysis of the QASO-A instrument revealed insufficient fit indices. As detailed in Table 4, the chi-square values were significant, and the chi-square to degrees of freedom ratio slightly exceeded the recommended threshold (4.83). Moreover, the CFI, TLI, SRMR, and RMSEA indices did not support the model's fit. To address

this, modification indices were examined to identify the impact of cross-loadings and residual correlations on the model. Residual covariances were found between items 21 and 22 (0.47), 23 and 24 (0.53), 24 and 25 (0.70), 23 and 25 (0.47), and 5 and 10 (0.38). To enhance the model fit, these residual covariances were incorporated, resulting in an improved analysis. The factor loadings and their respective residuals are presented in Figure 1.

Table 4. Fit indices of the instrument that aims to estimate the Quality of Care in Dental Services from the perspective of Adolescents, QASO-A, applied among students aged 12 to 15, from Montes Claros - MG, 2019/2020.

Model	c2 (gl)	c2/gl	CFI	TLI	SRMR	RMSEA (90% IC)	p-RMSEA
No adjustment	1122.35	4.48	0.85	0.83	0.11	0.10 (0.09-0.011)	<0.01
Adjusted	623.87 (268.00)	2.32	0.94	0.94	0.08	0.06 (0.06–0.07)	<0.01

Legend: c^2 = chi-square; gl = degrees of freedom; CFI = Comparative Fit Index; TLI = Tucker-Lewis Index; SRMR = Standardized Root Mean Square Residual; RMSEA = Root Mean Square Error of Approximation; * p < 0.001



Legend: EVL – Items of the evaluation dimension; STF – Items of the satisfaction dimension.
Figure 1. Factorial Structure, with factor loadings and measurement errors of the instrument that aims to estimate the Quality of Care in Dental Services from the perspective of Adolescents, QASO-A, applied among students aged 12 to 15, from Montes Claros - MG, 2019/2020.

Analysis of the presence of floor effect (evaluation = 4.32; satisfaction = 7.28) and ceiling effect (evaluation = 25.92; satisfaction = 43.69) showed no evidence of either in both scales. The reliability of internal consistency, measured by the composite reliability coefficient, was 0.73 for the Evaluation scale (9 items) and 0.83 for the Satisfaction scale (16 items). Considering that the instrument provided evidence of validity and reliability, the scores for the dimensions and the instrument were calculated, as shown in Table 3. In the comparisons between the scores of the scales and the QASO-A with dichotomous variables, no significant differences were observed

for age (assessment p = 0.65, Welch's t = −0.45; satisfaction p = 0.18, Welch's t = −1.34; QASO-A p = 0.25, Welch's t = −1.16) or biological sex (assessment p = 0.23, Welch's t = −1.21; satisfaction p = 0.14, Welch's t = −1.48; QASO-A p = 0.12, Welch's t = −1.55). However, a significant difference was found for age in the Evaluation scale (p = 0.02, Welch's t = −2.43, Cohen's d = 0.11) and the QASO-A (p = 0.06, Welch's t = −2.01), whereas no difference was detected for the satisfaction scale (p = 0.14, Welch's t = −1.49). When comparing with polytomous variables, no significant differences were found for self-reported race/color (assessment p = 0.31, F = 1.19; satisfaction p = 0.92, F = 0.17; QASO-A p = 0.79, Welch's t = 0.34).

Discussion

When analyzing the results related to the satisfaction with dental care dimension, nine questions were evaluated (Table 1). The first question assessed satisfaction with the care provided, revealing that most respondents were either very satisfied or somewhat satisfied, with dissatisfaction reported only in extreme cases. This low level of dissatisfaction may be attributed to the "gratitude bias," where individuals, often out of fear of losing access or due to their dependency on health professionals, tend to avoid criticizing the services provided[7]. The second question, concerning the freedom to choose a dentist, showed that the majority were very satisfied with this freedom. This is likely linked to the progress in oral health programs targeting children and adolescents, although the prevalence of dental issues remains high, particularly among economically disadvantaged groups[8].

The third question focused on travel time to the dental office, which is crucial as access influences care quality. The results indicated that 80.85% rated access as excellent or good. In the fourth question, respondents were asked about accessibility, and a high level of satisfaction was observed. Accessibility is a key factor, encompassing physical barriers that may hinder patients' ability to reach healthcare facilities, such as non-adapted corridors, bathrooms, doors, and stairs[29]. According to the National Primary Care Policy, ensuring the accessibility of healthcare services, with proximity, welcoming, and problem-solving capacity, is essential for effective primary care[30,31].

The fifth question asked about satisfaction with the physical structure of the dental office, with more than half of the respondents indicating dissatisfaction. The sixth question, addressing the adequacy of the waiting room space, received positive feedback, with the majority rating it as very adequate or adequate. Creating welcoming and healthy spaces in healthcare settings can enhance care relationships, making them more humanized and effective[32,33]. In the seventh question, the comfort of the dental office chair was assessed, and more than half reported it as "very uncomfortable" or "uncomfortable." The eighth question regarding the adequacy of materials and equipment was rated as very adequate by the majority, reinforcing the importance of quality supplies and equipment for a humanized service[34].

Question nine, related to satisfaction with the dental appointment scheduling process, also showed high satisfaction, as most respondents expressed being very satisfied. This aligns with the fact that dental emergencies are often the first point of access to

oral health services, but long waiting times can discourage people from seeking care[35]. Shifting to the dental care evaluation dimension, sixteen questions were assessed (Table 2). Question ten concerned satisfaction with waiting time before entering the dental office, with the majority expressing dissatisfaction. The waiting time is critical, as it serves as an opportunity for the patient to build trust with the professional and feel more comfortable during the appointment[36]. Questions eleven and twelve focused on cleanliness in the office and the availability of a toothbrushing station. Most respondents were satisfied with cleanliness, while 54.29% rated the toothbrushing station as excellent, though 21.71% of offices lacked this facility. This aligns with findings by Nóbrega et al.[7], confirming that satisfaction levels are an ongoing indicator of service quality.

Question thirteen, concerning respect during treatment, was rated very positively, with most respondents considering it very adequate. Respectful care contributes to patients' satisfaction and their perception that they received the treatment they deserved[37]. Question fourteen evaluated the dentist's manual dexterity and technical competence, with the majority rating it as very adequate or adequate. Professional experience and ongoing education play a crucial role in shaping patients' perceptions of care[38]. Question fifteen assessed the patient's involvement in decision-making, with most respondents feeling they had autonomy in their care. Question sixteen, focusing on professional-patient communication, also received positive responses, particularly regarding the clarity of explanations during procedures, which is essential for encouraging proper oral health care in adolescents[39].

Question seventeen, regarding the sufficiency of time for asking questions, showed that most adolescents felt they had enough time to clarify doubts, a positive outcome that emphasizes the importance of effective communication in healthcare. Questions eighteen and nineteen, concerning privacy during exams and treatments, also received "excellent" ratings for most respondents. Maintaining ethical conduct and ensuring privacy are vital for fostering trust and improving care interactions[40].

Question twenty, which evaluated the learning gained during care, received high marks, with most respondents rating it as "excellent" or "good." Similarly, questions twenty-one and twenty-two, addressing information on preventing dental problems and oral hygiene, showed positive results, reinforcing the importance of early preventive dental programs in promoting oral health[41]. Question twenty-three, related to diet and nutrition information, found that just over half of respondents rated the information as adequate. Given the significant role diet plays in dental caries, this is an essential area for improvement[42].

However, when it came to information about preventing oral cancer and performing oral self-exams (questions twenty-four and twenty-five), the majority of respondents reported not receiving adequate information. This highlights the need for increased awareness of oral cancer risks at all levels, including community, family, and individual education. Incorporating these topics into school programs, with the support of dental professionals, could help internalize this knowledge and empower adolescents to apply it at home[7,30].

As outlined by the "SB Brazil 2010" report, the "Brasil Sorridente" program emphasizes the importance of using epidemiological data to inform oral health policies. This is vital for improving the accessibility and quality of care through initiatives like the National Oral Health Policy, which aims to centralize practices that assess and monitor health risks and outcomes[30]. This study supports these efforts, as it found high satisfaction levels regarding the clarity of information provided during dental visits, which has a direct impact on health outcomes.

Donabedian[1] originally proposed three dimensions for evaluating healthcare quality: technical-scientific knowledge, process quality, and structural quality. These dimensions are now expanded into pillars: effectiveness, efficiency, optimization, acceptability, equity, and legitimacy. Each of these pillars contributes to a comprehensive definition of healthcare quality, and their application can significantly enhance patient outcomes when considered in conjunction with other factors like patient satisfaction and service accessibility.

Regular surveys, like the one conducted in this study, are essential for identifying strengths and areas for improvement in dental care. They also provide a foundation for creating policies that can further enhance service quality and accessibility, particularly within Brazil's Unified Health System (SUS)[30]. The data analysis in this study, using Confirmatory Factor Analysis (CFA), confirms the validity of the instrument and evaluates how well the theoretical model fits the data. CFA is a powerful statistical tool for assessing the factorial structure of instruments and helps to confirm that the items of a measurement tool align with the intended constructs[43,44]. It allows researchers to verify the appropriateness of item distribution and the interrelationships between factors, contributing to the overall flexibility and robustness of the analysis[45].

While this study provides valuable insights, some limitations must be acknowledged. Response bias could have influenced the results, particularly the gratitude bias that may have affected adolescents' assessments of service quality. Additionally, relying on self-reported data introduces the potential for recall bias. Future research should aim for a more diverse sample, longitudinal approaches to track changes in perceptions, and a deeper exploration of adolescents' experiences with dental services. Expanding the validation of the QASO-A instrument to different demographic groups would further improve its applicability and reliability. Moreover, to obtain fully representative data across all contexts, including private schools, future research should incorporate diverse sociodemographic profiles. To gain a deeper understanding of the quantitative data presented in this study, incorporating qualitative methods, such as interviews or open-ended questions, could provide valuable insights. Future studies exploring this adolescent context should consider this approach to enrich the interpretation of the findings.

The quality of dental care among adolescents aged 12 to 15 in this sample was generally rated positively. However, additional research on the topic is recommended, as new evidence could further strengthen and refine the development of public health policies aimed at improving the oral health of this population. The QASO-A instrument demonstrated validity and reliability for use with individuals sharing similar characteristics to those in this study. Nevertheless, it is crucial

to highlight that the validation and reliability of such an instrument should be an ongoing process, not limited to a single study, to ensure its continued applicability and accuracy.

Data Availability

The entire dataset supporting the results of this study is available upon request from the corresponding author.

Conflict of Interest

No potential conflict of interest relevant to this article was reported.

Author Contributions

Cláudio Wagnus Xavier Lopes Júnior: Study concept and design; acquisition of data; analysis and interpretation of data; and drafting of the manuscript**. Jéssica Rejane Durães Soares, Aline Soares Figueiredo Santos, Claudiojanes dos Reis, Marinilza Soares Mota Sales, Michelle Pimenta Oliveira:** Analysis and interpretation of data; and critical revision of the manuscript for important intellectual content. **Guilherme Almeida Borges:** Critical revision of the manuscript for important intellectual content. **Andréa Maria Eleutério de Barros Lima Martins:** Study concept and design; analysis and interpretation of data; drafting of the manuscript; critical revision of the manuscript for important intellectual content; administrative, technical, and material support; and study supervision. All authors approved the final version of the work and are accountable for all aspects of the work.

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