**Original Article**

# Psychometric Evaluation of the Spanish OSAKA Tool Among Dental Practitioners in Colombia

## Martín Bravo[1], Ángela Rivera[1], Andrés Molina[1]*

[1]Department of Public Health, Faculty of Medicine, Catholic University of the Most Holy Conception, Concepción 3349001, Chile.

**\*E-mail** ✉ amolina88@163.com

## ABSTRACT

This research aimed to examine how reliable and valid the Spanish version of the Obstructive Sleep Apnea Knowledge and Attitudes (OSAKA) questionnaire is when used with dental professionals in Colombia. A cross-sectional survey was carried out in Manizales, Colombia, from January to June 2024. The sample included 120 dental professionals—general dentists, specialists, residents, and academic staff—selected through stratified random sampling. Participants completed the Spanish-adapted OSAKA questionnaire and a sociodemographic form. Internal consistency was measured using Cronbach's alpha (α) and McDonald's Omega (Ω). Construct validity was evaluated using exploratory factor analysis (EFA), supported by Kaiser-Meyer-Olkin (KMO) and Bartlett's tests.

The knowledge section of the questionnaire (18 items) showed strong internal consistency (α = 0.83; Ω = 0.83). The attitude section (5 items) had acceptable reliability (α = 0.68; Ω = 0.59). KMO values were 0.79 for knowledge and 0.57 for attitudes, and both Bartlett's tests were statistically significant (p ≤ 0.001). EFA confirmed the questionnaire's factor structure, identifying six components for the knowledge scale that explained 61.66% of the variance and two components for the attitude scale that explained 79.49%. Significant differences were observed in attitude scores among professional categories (p ≤ 0.001, η² = 0.13), with specialists showing the highest mean ($\overline{X}$ = 17.66) and general dentists the lowest ($\overline{X}$ = 14.62). Knowledge scores did not differ significantly between groups (p = 0.47). The Spanish adaptation of the OSAKA questionnaire demonstrated satisfactory reliability and validity for assessing dental professionals' knowledge and attitudes toward obstructive sleep apnea in Colombia. Its implementation can aid in improving educational programs, early detection, and collaboration between dental and medical professionals.

**Keywords:** Obstructive sleep apnea, Psychometrics, Dentists, Health knowledge, Attitudes, Surveys

## Introduction

Obstructive sleep apnea (OSA) is a common disorder that causes repeated pauses in breathing during sleep due to partial or complete blockage of the upper airway. These interruptions lead to oxygen drops, fragmented sleep, and overall poor sleep quality [1]. OSA is linked to several health problems—including cardiovascular, metabolic, and mental disorders—that can reduce life quality and increase healthcare costs worldwide [2, 3]. When left untreated, OSA contributes to serious risks such as heart disease, mood disorders, and accidents caused by excessive sleepiness, making it a major public health challenge [4–6]. Studies estimate that roughly 54% of adults worldwide experience some degree of OSA, and the likelihood rises with age [7].

Although overnight polysomnography is the diagnostic gold standard [8, 9], its use is often limited by cost, accessibility, and patient discomfort. These challenges have led to growing interest in simpler and more accessible diagnostic options—such as home sleep apnea tests (HSAT) [10, 11] and clinical screening

questionnaires—which allow early detection of individuals at risk [12–15]. Because dentists see patients regularly and for extended periods, they can play an important role in identifying possible OSA cases [16, 17]. By observing oral and throat structures such as the tongue, palate, and tonsils during checkups, dentists may notice features associated with sleep-disordered breathing [18]. They can also use validated questionnaires to screen patients and refer them for specialized care when necessary [19]. Additionally, dentists are involved in OSA treatment, particularly through the design and follow-up of mandibular advancement devices in cooperation with medical professionals [20]. To perform these roles effectively, however, they must possess sufficient knowledge of OSA and maintain a positive attitude toward its management.

Despite this potential, little research has explored how well dental professionals understand or approach OSA [17, 21, 22]. Most previous studies have focused on physicians, while dental teams have received less attention [21, 22]. Although many dentists show a willingness to participate in OSA care, their actual knowledge of diagnosis and treatment varies widely [23]. Their involvement is often limited by a lack of formal training or clinical exposure in sleep medicine [16]. This issue is particularly relevant in Latin America, where OSA is increasingly recognized as a serious public health concern. In Colombia specifically, rising OSA rates highlight the need for professional awareness and better educational resources [24]. Therefore, having reliable and validated instruments to assess dentists' understanding and attitudes toward OSA is essential.

One such tool is the Obstructive Sleep Apnea Knowledge and Attitudes (OSAKA) questionnaire, which has been translated and validated in several Spanish-speaking countries, including Peru, Venezuela, and Ecuador [25]. However, its validity in Colombia's dental community has not yet been confirmed. To fill this gap, the present study aimed to evaluate the reliability and validity of the Spanish version of the OSAKA questionnaire among Colombian dental professionals and to determine its usefulness as a tool for education, research, and clinical application in this setting.

## Materials and Methods

### Study design

A quantitative, cross-sectional observational study was carried out to assess the internal consistency and structural validity of the Spanish version of the Obstructive Sleep Apnea Knowledge and Attitudes

(OSAKA) questionnaire [25]. The study followed the STROBE (Strengthening the Reporting of Observational Studies in Epidemiology) guidelines for observational research [26]. Ethical approval was obtained from the Ethics Committee of the Autonomous University of Manizales (Protocol code: GIN-FOR-003; Approval date: March 22, 2023). All procedures complied with Resolution No. 8430 of 1993 issued by the Colombian Ministry of Health and the ethical standards outlined in the Declaration of Helsinki [27].

### Study context

In Colombia, obstructive sleep apnea (OSA) and related sleep disorders are increasingly recognized as major public health concerns due to their effects on health, daily functioning, and quality of life [24]. Despite this, few validated Spanish or Portuguese instruments exist for assessing such disorders within Latin American populations [16, 25]. To address this need, several Spanish versions of the OSAKA questionnaire have been culturally adapted and validated, proving valuable for research, professional education, and clinical quality improvement [25]. However, the instrument's validity and applicability among Colombian dental professionals—such as residents, general dentists, and specialists—had not yet been tested. Differences in academic backgrounds, training programs, and clinical settings highlight the importance of confirming its psychometric performance within the Colombian context.

### Participants

The study took place between January and June 2024 in outpatient dental clinics across public, private, and academic sectors in Manizales, Colombia. Eligible participants included actively practicing dental professionals, categorized into four groups: university clinical faculty, dental residents in specialization programs, dental specialists, and general dentists.

A total of 120 participants were chosen through stratified random sampling to ensure balanced representation of each category. Data were collected using a mixed-format approach—either in-person interviews conducted by the research team or through an online questionnaire distributed via Google Forms. In both cases, written informed consent was obtained before participation. No participants were lost during data collection, and all 120 responses were included in the final analysis.

Inclusion criteria consisted of licensed and currently active dental practitioners, residents, or academic clinicians working in Manizales. Exclusion criteria included inactive professionals, undergraduate

students, and incomplete or duplicated responses. All participants were briefed on the study's purpose, inclusion requirements, and confidentiality procedures before consenting to participate.

*Instruments, variables, and data sources*
The main tool used in this research was the OSAKA questionnaire, which evaluates healthcare professionals' knowledge and attitudes toward the recognition and management of obstructive sleep apnea [22, 28]. This instrument has been previously validated in several Latin American countries, including in its Spanish adaptation [21, 25, 29]. It contains 23 items divided into two sections:

*Knowledge section*
This section includes 18 items covering key topics such as epidemiology, pathophysiology, clinical signs, diagnostic approaches, and treatment options for OSA. Response options are "true," "false," and "I don't know." One point is awarded for each correct answer, while incorrect or "I don't know" responses receive zero points. The correct response for items 3, 4, 5, 6, 7, 9, 10, 11, 13, 14, 16, 17, and 18 is "true." Scores can range from 0 to 18, with higher scores reflecting greater knowledge [25].

*Attitude section*
This section consists of five statements rated on a 5-point Likert scale, from 1 ("strongly disagree") to 5 ("strongly agree"). The total attitude score, ranging from 5 to 25 points, reflects participants' overall attitude toward OSA diagnosis and management—higher scores indicate more positive attitudes [25].
Additionally, a structured demographic form was used to record participants' age, sex, professional role, and years of clinical experience. All information was collected anonymously using the Google Forms platform.

*Sociodemographic variables*
The collected demographic data included participants' gender (male or female), age (in years), professional role (general dentist, specialist, resident, or academic clinician), and total years of clinical practice. These variables helped provide context for the results, allowing for comparisons across professional subgroups and for identifying any patterns between background characteristics and OSA-related knowledge or attitudes.

*Bias*
Some limitations and possible sources of bias should be noted when interpreting the findings.

*Geographical bias:* Since the study was limited to dentists working in urban Manizales, the outcomes might not reflect the experiences of professionals in rural regions or areas with different demographic profiles [30].
*Unmeasured variables:* Previous education or formal training in sleep medicine was not assessed, which might have influenced participants' responses and acted as a confounding variable [31].
Despite these constraints, this research provides an important first look at how Colombian dentists understand and perceive OSA and can serve as a foundation for larger, more representative future studies.

*Sample size*
Based on the 2018 Colombian Population and Housing Census [32], Manizales has about 434,000 residents. Using an average national ratio of one dentist per 2,500 people [33], the estimated number of practicing dentists in the city was approximately 174. With a 95% confidence level, 5% margin of error, and an assumed response proportion of 50% (p = 0.5), the required minimum sample size was 120 participants—exactly the number recruited for the study. This figure aligns with established recommendations for psychometric validation research in healthcare, especially when participant diversity is ensured through stratified sampling [34–36].

*Statistical analysis*
Data analysis was performed with IBM SPSS Statistics version 27.0 (IBM Corp., Armonk, NY, USA). Both descriptive and inferential analyses were carried out to evaluate the questionnaire's psychometric soundness.
For descriptive analysis, frequencies, percentages, means, and standard deviations were calculated. Group comparisons across professional categories used Pearson's chi-square test for categorical variables (e.g., gender), with Cohen's $w$ as a measure of effect size. Continuous variables such as years of experience and OSAKA scores were compared using one-way ANOVA followed by Tukey's post hoc tests. Effect sizes were estimated through partial eta-squared ($\eta^2$) and Cohen's $d$, interpreted as small (0.01/0.10), medium (0.06/0.30), and large (0.14/0.70) according to standard conventions [37, 38].
An exploratory factor analysis (EFA) using principal component extraction with Varimax rotation was employed to evaluate construct validity. Sampling adequacy was determined using the Kaiser-Meyer-Olkin (KMO) measure and Bartlett's test of sphericity. A KMO above 0.60, a significant Bartlett's test (p < 0.05), and factor loadings ≥ 0.40 were considered

acceptable indicators [39]. Reliability was assessed through Cronbach's alpha and McDonald's Omega, where coefficients of 0.65 or higher were deemed satisfactory [40–42].

All analyses applied a significance level of $\alpha = 0.05$ and 95% confidence intervals. Effect sizes were interpreted following Cohen's criteria for *d*, $\eta^2$, and *w* [38].

**Results and Discussion**

*Sociodemographic profile of participants*

**Table 1** presents the main demographic features of the participants, categorized by professional group. Overall, women made up the majority across all categories, most notably among residents (77.33%) and general dentists (61.70%). Although these gender differences were not statistically significant (p = 0.29), the weak effect size (w = 0.18) suggested a minimal association.

**Table 1.** Distribution of Dental Professionals by Sex, Specialization, and Clinical Experience

| Variable | General Dentist | Resident of Specialization | Specialist | Academic | p-Value | Effect Size |
|---|---|---|---|---|---|---|
| **Sex** | | | | | 0.29 | 0.18 (w) |
| Male | 18 (38.30%) | 8 (26.67%) | 16 (50%) | 5 (45.45%) | | |
| Female | 29 (61.70%) | 22 (73.33%) | 16 (50%) | 6 (54.55%) | | |
| **Clinical Practice (Years)** | $10.23 \pm 9.66$ | $5.90 \pm 3.31$ | $11 \pm 7.31$ | $18 \pm 10.95$ | ≤0.001 * | 0.12 ($\eta^2$) |

%: percentage, *: $p \leq 0.001$ indicates statistically significant differences $\chi^2$ test, w: effect size determined by Cramer's V, $\eta^2$: Effect size determined by partial eta square.

Regarding years of professional experience, significant variations were evident among the groups. Academic clinicians had the longest practice history ($18 \pm 10.95$ years), followed by specialists ($11 \pm 7.31$), general dentists ($10.23 \pm 9.66$), and residents ($5.90 \pm 3.31$). This difference was statistically significant ($p \leq 0.001$) and demonstrated a medium effect size ($\eta^2 = 0.12$), indicating that clinical experience was unevenly distributed among the professional categories. Such disparities help contextualize potential variations in OSA-related knowledge and attitudes.

*Knowledge and attitude toward OSA*

**Table 2** summarizes the descriptive and inferential results for both knowledge and attitude domains across dental specialties. In the attitude domain, differences between professional groups were more pronounced. The ANOVA results confirmed a statistically significant variation ($p \leq 0.001$) with a moderate effect size ($\eta^2 = 0,13$). Specialists achieved the highest mean attitude score ($\bar{X} = 17.66$), followed by academic clinicians ($\bar{X} = 16.73$), residents ($\bar{X} = 16,57$), and general dentists ($\bar{X} = 14.62$).

**Table 2.** Average number of correct answers in the total knowledge and attitude dimension according to dental specialty (n = 120).

| Category | Group | n (%) | Mean ± SD | 95% CI | p-Value | Effect Size |
|---|---|---|---|---|---|---|
| **Knowledge** | | | | | 0.47 | 0.13 ($\eta^2$) |
| | General Dentist | 47 (39.17%) | $8.85 \pm 3.29$ | 7.88–9.82 | | |
| | Resident | 30 (25.00%) | $10.10 \pm 2.47$ | 9.18–11.02 | | |
| | Specialization | 32 (26.67%) | $9.87 \pm 3.22$ | 8.71–11.04 | | |
| | Academic | 11 (9.16%) | $9.73 \pm 4.86$ | 6.46–12.99 | | |
| | **Total** | 120 (100%) | $9.52 \pm 3.26$ | 8.93–10.11 | | |
| **Attitudes** | | | | | ≤0.001 * | 0.13 ($\eta^2$) |
| | General Dentist | 47 (39.17%) | $14.62 \pm 3.02$ | 13.73–15.51 | | |
| | Resident | 30 (25.00%) | $16.57 \pm 3.11$ | 15.40–17.73 | | |
| | Specialization | 32 (26.67%) | $17.66 \pm 3.88$ | 16.26–19.06 | | |
| | Academic | 11 (9.16%) | $16.73 \pm 3.50$ | 14.38–19.08 | | |
| | **Total** | 120 (100%) | $16.11 \pm 3.53$ | 15.47–16.75 | | |
| **Attitude Comparisons** | | **Mean ($\bar{X}1$)** | **Mean ($\bar{X}2$)** | | | |

| | | | |
|---|---|---|---|
| General Dentist vs. Resident | 14.62 | 16.57 | 0.07 | 0.64 (d) |
| General Dentist vs. Specialization | 14.62 | 17.66 | ≤0.001 * | 0.89 (d) |
| General Dentist vs. Academic | 14.62 | 16.73 | 0.24 | 0.67 (d) |
| Resident vs. Specialization | 16.57 | 17.66 | 0.57 | 0.30 (d) |
| Resident vs. Academic | 16.57 | 16.73 | 0.99 | 0.05 (d) |
| Specialization vs. Academic | 17.66 | 16.73 | 0.86 | 0.25 (d) |

%: percentage, $\bar{X}$: mean, SD: standard deviations, *: p ≤ 0.001 indicates statistically significant differences Tukey HSD, $\eta^2$: effect size determined by partial eta square, d: effect size determined by Cohen d.

Tukey's post hoc test revealed a clear distinction between general dentists and specialists (p ≤ 0.001), supported by a large effect size (d = 0.89). Moderate differences were also seen between general dentists and residents (d = 0.64) as well as between general dentists and academics (d = 0.67), though these were not statistically significant. Overall, these findings point to varying levels of engagement and attitude toward OSA across professional groups, underlining the importance of enhancing awareness and clinical confidence, particularly among general practitioners.

In contrast, knowledge scores did not differ significantly between the groups, suggesting a more uniform understanding of OSA concepts across the sample.

*Internal reliability of the OSAKA questionnaire*

As shown in **Table 3**, the OSAKA questionnaire demonstrated solid internal reliability when used among dental professionals. The knowledge section (18 items) recorded an average score of 32.03 (±6.89), with both Cronbach's alpha and McDonald's Omega values reaching 0.83. These results confirm that the questionnaire reliably measures OSA-related knowledge within this professional population.

**Table 3.** Reliability analysis for the OSAKA questionnaire in Spanish.

| Dimensions | Number of Items | $\bar{X}$ ± SD | Cronbach's Alpha | McDonald's Omega |
|---|---|---|---|---|
| Knowledge | 18 | 32.03 ± 6.89 | 0.83 * | 0.83 * |
| Attitudes | 5 | 16.11 ± 3.53 | 0.68 * | 0.59 |

$\bar{X}$: mean, SD: standard deviations, *: good internal consistency determined by Cronbach's alpha and McDonald's Omega.

The attitude subscale, consisting of 5 items, had an average score of 16.11 (±3.53) with Cronbach's alpha at 0.68 and McDonald's Omega at 0.59. Although these values fall slightly below the generally preferred threshold of 0.65, they are considered acceptable for exploratory research purposes. Overall, the results indicate that the OSAKA questionnaire provides a reasonably reliable measure of both knowledge and attitudes toward obstructive sleep apnea in this dental population.

*Exploratory factor analysis of the OSAKA questionnaire*

Exploratory factor analysis (EFA) was conducted separately for the knowledge and attitude sections, as shown in **Table 4**. The knowledge subscale demonstrated good sampling adequacy with a KMO value of 0.79. Analysis extracted six principal components that together accounted for 61.66% of the variance, suggesting that the subscale captures multiple underlying dimensions aligned with the diverse content areas covered by the items.

**Table 4.** Exploratory factor analysis results for knowledge and attitudes dimensions.

| Dimensions | Kaiser Meyer Olkin | Bartlett's Test | Component | Eigenvalue | Variance Explained for Components (%) | Cumulative Variance (%) | Reproduced Correlation (r) |
|---|---|---|---|---|---|---|---|
| Knowled | 0.79 * | $X^2 =$ 524.68 df = 153 | 1 | 4.83 *** | 26.85 | 26.85 | 0.58 |
| | | | 2 | 1.69 *** | 9.40 | 36.25 | 0.66 |
| | | | 3 | 1.28 *** | 7.11 | 43.36 | 0.61 |

| | | | | | |
|---|---|---|---|---|---|
| p ≤ 0.001 ** | | 4 | 1.18 *** | 6.56 | 49.92 | 0.62 |
| | | 5 | 1.10 *** | 6.12 | 56.04 | 0.65 |
| | | 6 | 1.01 *** | 5.62 | 61.66 | 0.81 |
| | | 7 | 0.93 | 5.19 | 66.85 | 0.47 |
| | | 8 | 0.78 | 4.31 | 71.16 | 0.62 |
| | | 9 | 0.72 | 4.02 | 75.18 | 0.72 |
| | | 10 | 0.69 | 3.82 | 79.00 | 0.62 |
| | | 11 | 0.68 | 3.79 | 82.79 | 0.43 |
| | | 12 | 0.57 | 3.14 | 85.93 | 0.68 |
| | | 13 | 0.55 | 3.05 | 88.98 | 0.66 |
| | | 14 | 0.52 | 2.89 | 91.87 | 0.67 |
| | | 15 | 0.46 | 2.53 | 94.40 | 0.46 |
| | | 16 | 0.39 | 2.16 | 96.56 | 0.52 |
| | | 17 | 0.33 | 1.83 | 98.39 | 0.64 |
| | | 18 | 0.29 | 1.61 | 100 | 0.70 |
| **Attitudes** | 0.57 | $X^2 =$ 258.20 df = 10 p ≤ 0.001 ** | 1 | 2.21 *** | 44.12 | 44.12 | 0.90 |
| | | | 2 | 1.77 *** | 35.37 | 79.49 | 0.89 |
| | | | 3 | 0.58 | 11.64 | 91.13 | 0.68 |
| | | | 4 | 0.26 | 5.11 | 96.24 | 0.85 |
| | | | 5 | 0.19 | 3.76 | 100 | 0.66 |

*: Kaiser Meyer Olkin values ≥0.60 indicate acceptable adequacy, **: Bartlett's test values p ≤ 0.001 indicates statistically significant factorable data, ***: Eigenvalue >1 in Kaiser criterion indicates retains component.

The attitude subscale showed a relatively low KMO value of 0.57; however, Bartlett's test of sphericity was significant, supporting a potential two-factor structure. These two components together explained 79.49% of the variance, suggesting an acceptable internal organization despite some limitations in sampling adequacy.

The present study demonstrates that the Spanish version of the OSAKA questionnaire is both structurally valid and internally reliable for use among Colombian dental professionals. The knowledge subscale showed strong internal consistency (α = 0.83; Ω = 0.83), consistent with previous Latin American studies where reliability coefficients were sometimes lower (e.g., α = 0.58), confirming the robustness of the instrument across different Spanish-speaking populations [25].

For the attitude subscale, Cronbach's alpha and McDonald's Omega were close to the recommended threshold (α = 0.68; Ω = 0.59). While slightly below ideal values, these coefficients are acceptable for exploratory studies, especially for short scales with heterogeneous items, reflecting the variability inherent in attitudinal constructs. These findings emphasize the need for targeted educational interventions to strengthen attitudes toward OSA diagnosis and management [40–44].

Structurally, exploratory factor analysis revealed a coherent organization of items with satisfactory factor loadings and KMO values above 0.70 for the knowledge subscale, supporting the bifactorial model reported in prior validations [45, 46]. This supports the applicability of the OSAKA questionnaire in Colombian dental settings and encourages its use in both clinical education and screening programs.

The questionnaire can serve as both an assessment tool and a resource for continuing education, allowing educators to track knowledge gaps and evaluate the impact of training interventions over time.

Regarding knowledge levels, the mean score was 9.52, lower than in the original and previous Latin American adaptations [15, 25, 28]. Residents scored highest, likely due to more recent academic exposure [47]. Differences between groups were not statistically significant (p = 0.47), indicating a relatively uniform but insufficient baseline knowledge, highlighting the importance of integrating OSA education into undergraduate curricula [23].

Conversely, attitude scores showed significant differences (p ≤ 0.001; η² = 0.13), with specialists and academics demonstrating more positive attitudes than

general dentists [17]. This pattern, previously reported, may hinder early detection in routine dental care as less engaged practitioners may overlook clinical signs of OSA [17, 48, 49].

Interestingly, years of professional experience did not guarantee higher knowledge or proactive attitudes. Older clinicians may lack recent updates, emphasizing that ongoing education, rather than experience alone, is critical for effective OSA management [15, 17, 25]. The large effect size between general dentists and specialists (d = 0.89) reinforces the urgency of incorporating sleep medicine into dental training.

Despite awareness of oral appliance use, some dentists maintain a passive attitude toward clinical application, often due to gaps in dental sleep medicine education [16, 17, 50]. Patient adherence to mandibular advancement devices also depends on behavioral and psychological factors such as motivation, perceived effectiveness, and comfort, which should be considered in future training [51].

Enhancing continuing education and specialized training is therefore essential to reduce care gaps in populations with high OSA prevalence and low diagnostic awareness [17, 52, 53]. Future strategies could include clinical simulations, interprofessional education, and digital platforms to improve knowledge retention and clinical practice. While the OSAKA questionnaire remains a valuable assessment tool, other instruments like STOP-BANG, Berlin, or NoSAS could complement future studies, integrating risk stratification with knowledge evaluation to better prepare dental professionals for patient care [54–56].

This study has several key strengths. It represents the first effort to validate the OSAKA questionnaire in a sample of Colombian clinical dentists, providing a reliable method to evaluate knowledge and attitudes regarding OSA in this population. The study's use of exploratory factor analysis and its demonstration of good internal consistency support the instrument's applicability in this new setting. Including a mix of professional categories—general dentists, specialists, residents, and academic faculty—also allowed for the detection of meaningful differences across training and experience levels.

Nevertheless, there are limitations to consider. The voluntary nature of participation may have introduced self-selection bias, with more motivated or knowledgeable dentists being more likely to respond, possibly leading to an overestimation of results [30]. The urban and academic composition of the sample limits the generalizability of findings to rural areas or regions with fewer educational resources [31]. Additionally, the study did not account for prior sleep medicine training or direct clinical experience with OSA patients, restricting a deeper analysis of factors influencing knowledge and attitudes [32].

## Conclusion

This research confirms that the OSAKA questionnaire is a valid and reliable tool for assessing OSA-related knowledge and attitudes among Colombian clinical dentists. The results underscore its usefulness in both educational and clinical contexts, while highlighting disparities in attitudes toward diagnosis across professional levels.

The findings reinforce the need to integrate sleep medicine into dental education, particularly in undergraduate programs, and to implement strategies that engage general dentists in early identification of OSA. Future investigations should expand to multicenter studies, incorporate confirmatory factor analyses, and consider additional clinical variables to further establish the OSAKA questionnaire as an effective instrument for both assessment and training in dentistry.

## References

1. Anderson N, Tran P. Obstructive sleep apnea. Prim Care. 2025;52(1):47–59.

2. Pauletto P, Réus JC, Bolan M, Massignan C, Flores-Mir C, Maia I, et al. Association between obstructive sleep apnea and health-related quality of life in untreated adults: A systematic review. Sleep Breath. 2021;25(4):1773–89.

3. Park JW, Hamoda MM, Almeida FR, Wang Z, Wensley D, Alalola B, et al. Socioeconomic inequalities in pediatric obstructive sleep apnea. J Clin Sleep Med. 2022;18(3):637–45.

4. Yeghiazarians Y, Jneid H, Tietjens JR, Redline S, Brown DL, El-Sherif N, et al. Obstructive sleep apnea and cardiovascular disease: A scientific statement from the American Heart Association. Circulation. 2021;144(3):e56–67.

5. Liu H, Wang X, Feng H, Zhou S, Pan J, Ouyang C, et al. Obstructive sleep apnea and mental disorders: A bidirectional mendelian

randomization study. BMC Psychiatry. 2024;24(1):304.

6. Udholm N, Rex CE, Fuglsang M, Lundbye-Christensen S, Bille J, Udholm S. Obstructive sleep apnea and road traffic accidents: A Danish nationwide cohort study. Sleep Med. 2022;96:64–9.

7. de Araujo Dantas AB, Gonçalves FM, Martins AA, Alves GÂ, Stechman-Neto J, Corrêa CC, et al. Worldwide prevalence and associated risk factors of obstructive sleep apnea: A meta-analysis and meta-regression. Sleep Breath. 2023;27(4):2083–109.

8. Sá DM, Vianna EO. Polysomnographic evaluation of obstructive sleep apnea treatment with fixed pressure CPAP determined by formula. Sleep Breath. 2023;27(1):145–52.

9. Vena D, Taranto-Montemurro L, Azarbarzin A, Op de Beeck S, Marques M, Vanderveken OM, et al. Clinical polysomnographic methods for estimating pharyngeal collapsibility in obstructive sleep apnea. Sleep. 2022;45(4):zsac050.

10. Hirshkowitz M. Polysomnography challenges. Sleep Med Clin. 2016;11(3):403–11.

11. Green A, Nagel N, Kemer L, Dagan Y. Comparing in-lab full polysomnography for diagnosing sleep apnea in children to home sleep apnea tests (HSAT) with an online video attending technician. Sleep Biol Rhythms. 2022;20(4):397–401.

12. Hwang M, Nagappa M, Guluzade N, Saripella A, Englesakis M, Chung F. Validation of the STOP-Bang questionnaire as a preoperative screening tool for obstructive sleep apnea: A systematic review and meta-analysis. BMC Anesthesiol. 2022;22(1):366.

13. Brunetto DP, Moschik CE, Dominguez-Mompell R, Jaria E, Sant'Anna EF, Moon W. Mini-implant assisted rapid palatal expansion (MARPE) effects on adult obstructive sleep apnea (OSA) and quality of life: A multi-center prospective controlled trial. Prog Orthod. 2022;23(1):3.

14. Xing Y, Zhang Z, Yin J, Liu Y, Shuai Z, Liu Z, et al. Utilization of the GOAL questionnaire as a standardized screening tool for obstructive sleep apnea. Sci Rep. 2023;13(1):5489.

15. Silva FSL, Furlanetto KC, Neves LMT, Cipriano GFB, Accioly MF, Viana-Júnior AB, et al. Translation, transcultural adaptation, and validation of the Brazilian Portuguese version of the Obstructive Sleep Apnea Knowledge and Attitudes (OSAKA) questionnaire. Sleep Breath. 2023;27(2):1195–201.

16. Nguyen VT. Knowledge, attitude, and clinical practice of dentists toward obstructive sleep apnea: A literature review. Cranio. 2023;41(3):238–44.

17. Alzahrani MM, Alghamdi AA, Alghamdi SA, Alotaibi RK. Knowledge and attitude of dentists towards obstructive sleep apnea. Int Dent J. 2022;72(3):315–21.

18. Spencer JR. Dental diagnosis and treatment of obstructive sleep apnea: An overview. Compend Contin Educ Dent. 2023;44(6):308–12.

19. Akashiba T, Inoue Y, Uchimura N, Ohi M, Kasai T, Kawana F, et al. Sleep apnea syndrome (SAS) clinical practice guidelines 2020. Respir Investig. 2022;60(1):3–32.

20. Marchetti E, Petro E, Gaggioli F, Lardani L, Mancini L, Marzo G. The dentist's role in diagnosis and treatment of obstructive sleep apnea syndrome: A literature review. J Biol Regul Homeost Agents. 2020;34(1):173–80.

21. Díaz-Díaz MF, Schlaefli-Arrieta X, Caballero García S, Geller Palti D. Association between knowledge and attitudes towards pediatric obstructive sleep apnea and dental specialty. Cranio. 2023;43(4):678–87.

22. Reibel YG, Pusalavidyasagar S, Flynn PM. Obstructive sleep apnea knowledge: Attitudes and screening practices of Minnesota dental hygienists. J Dent Hyg. 2019;93(3):29–36.

23. Kale SS, Kakodkar P, Shetiya SH. Obstructive sleep apnea domains: Knowledge, attitude and practice results of dentists from a dental college in India. Sleep Sci. 2020;13(1):3–9.

24. Waich A, Ruiz Severiche J, Manrique Andrade M, Castañeda Aza JA, Castellanos Ramírez JC, Otero Mendoza L, et al. Prevalence of sleep apnea in children and adolescents in Colombia according to the national health registry 2017–2021. PLoS One. 2022;17(9):e0273324.

25. Cherrez Ojeda I, Jeffe DB, Guerrero T, Mantilla R, Santoro I, Gabino G, et al. Attitudes and knowledge about obstructive sleep apnea among Latin American primary care physicians. Sleep Med. 2013;14(10):973–7.

26. Cuschieri S. The STROBE guidelines. Saudi J Anaesth. 2019;13(Suppl 1):S31–4.

27. World Medical Association. World Medical Association Declaration of Helsinki: Ethical principles for medical research involving human participants. JAMA. 2025;333(1):71–4.

28. Schotland HM, Jeffe DB. Development of the obstructive sleep apnea knowledge and attitudes

(OSAKA) questionnaire. Sleep Med. 2003;4(5):443–50.

29. Sperber AD. Translation and validation of study instruments for cross-cultural research. Gastroenterology. 2004;126(1 Suppl):S124–8.

30. Skopec M, Issa H, Reed J, Harris M. The role of geographic bias in knowledge diffusion: A systematic review and narrative synthesis. Res Integr Peer Rev. 2020;5(1):2.

31. Hess DR. Observational studies. Respir Care. 2023;68(11):1585–97.

32. National Administrative Department of Statistics. 2018 National Population and Housing Census. Bogotá: DANE; 2019. Available from: https://www.dane.gov.co/index.php/estadisticas-por-tema/demografia-y-poblacion/censo-nacional-de-poblacion-y-vivenda-2018 [Accessed 2025 Jun 9].

33. Donatres-Giraldo JA, Rojas-Amador MA, Jiménez-Barbos WG. Quality of life of dentists in Colombia: Exploratory literature review. Univ Odontol. 2017;36(76):1–18.

34. Serdar CC, Cihan M, Yücel D, Serdar MA. Sample size, power and effect size revisited: Simplified and practical approaches in pre-clinical, clinical and laboratory studies. Biochem Med. 2021;31(1):010502.

35. Shieh G. Effect size, statistical power, and sample size for assessing interactions between categorical and continuous variables. Br J Math Stat Psychol. 2019;72(1):136–54.

36. Gunawan J, Marzilli C, Aungsuroch Y. Establishing appropriate sample size for developing and validating a questionnaire in nursing research. Belitung Nurs J. 2021;7(5):356–60.

37. Shieh G. Confidence intervals and sample size calculations for the weighted eta-squared effect sizes in one-way heteroscedastic ANOVA. Behav Res Methods. 2013;45(1):25–37.

38. Zieliński G, Gawda P. Defining effect size standards in temporomandibular joint and masticatory muscle research. Med Sci Monit. 2025;31(1):e948365.

39. Polit DF, Beck CT. Nursing research: Generating and assessing evidence in nursing practice. 10th ed. Philadelphia (PA): Lippincott Williams & Wilkins; 2016.

40. Alzain MA, Asweto CO, Hassan SU, Saeed ME, Kassar A, Alsaif B. Psychometric properties of suboptimal health status instruments: A systematic review. J Pers Med. 2023;13(2):299.

41. Roco-Videla Á, Aguilera-Eguía R, Olguin-Barraza M. Ventajas del uso del coeficiente de omega de McDonald frente al alfa de Cronbach. Nutr Hosp. 2024;41(2):262–3.

42. Trizano-Hermosilla I, Alvarado JM. Best alternatives to Cronbach's alpha reliability in realistic conditions: Congeneric and asymmetrical measurements. Front Psychol. 2016;7(1):769.

43. Annear MJ, Toye C, Elliott KJ, McInerney F, Eccleston C, Robinson A. Dementia knowledge assessment scale (DKAS): Confirmatory factor analysis and comparative subscale scores among an international cohort. BMC Geriatr. 2017;17(1):168.

44. Xiao YY, Li T, Xiao L, Wang SW, Wang SQ, Wang HX, et al. The Chinese version of Instrument of Professional Attitude for Student Nurses (IPASN): Assessment of reliability and validity. Nurse Educ Today. 2017;49(1):79–83.

45. Schreiber JB. Issues and recommendations for exploratory factor analysis and principal component analysis. Res Social Adm Pharm. 2021;17(5):1004–11.

46. Gaskin CJ, Happell B. On exploratory factor analysis: A review of recent evidence, an assessment of current practice, and recommendations for future use. Int J Nurs Stud. 2014;51(3):511–21.

47. Plaza-Ruíz SP, Barbosa-Liz DM, Agudelo-Suárez AA. Impact of COVID-19 on the knowledge and attitudes of dentists toward teledentistry. JDR Clin Trans Res. 2021;6(3):268–78.

48. Vuorjoki-Ranta TR, Lobbezoo F, Vehkalahti M, Tuomilehto H, Ahlberg J. Treatment of obstructive sleep apnoea patients in community dental care: Knowledge and attitudes among general dental practitioners and specialist dentists. J Oral Rehabil. 2016;43(12):937–42.

49. Shinde JD, Mowade TK, Tekale RG, Radke UM. Obstructive sleep apnea (OSA) knowledge and attitudes among recent dental graduates: A cross-sectional study. J Indian Dent Assoc. 2021;15(4):29–34.

50. Jokubauskas L, Pileičikienė G, Žekonis G, Baltrušaitytė A. Lithuanian dentists' knowledge, attitudes, and clinical practices regarding obstructive sleep apnea: A nationwide cross-sectional study. Cranio. 2019;37(4):238–45.

51. Fleury M, Le Vaillant M, Pelletier-Fleury N; Sleep Cohort Group. Socio-economic status: A barrier to access to mandibular advancement device therapy for patients with obstructive sleep apnea syndrome in France. PLoS One. 2015;10(9):e0138689.

52. Pallamparthy S, Basavareddy A. Knowledge, attitude, practice, and barriers toward research among medical students: A cross-sectional questionnaire-based survey. Perspect Clin Res. 2019;10(2):73–8.

53. Alehegn HZ, Asiferaw ET, Welda ZG, Emiru YK, Hussen SM, Kifle ZDl, et al. Medical and health science students' knowledge, attitude, and practice towards complementary and alternative medicine in University of Gondar. Clin Epidemiol Glob Health. 2022;17(1):101148.

54. Herschmann S, Berger M, Haba-Rubio J, Heinzer R. Comparison of NoSAS score with Berlin and STOP-BANG scores for sleep apnea detection in a clinical sample. Sleep Med. 2021;79(1):113–6.

55. Sindi MA, Mirdad M, Al-Sebaei M, Bamashmous M. Identification of patients at risk of obstructive sleep apnea in dental settings. Cureus. 2023;15(7):e44646.

56. Perry S, Bridges SM, Burrow MF. A review of the use of simulation in dental education. Simul Healthc. 2015;10(1):31–7.