Original Research

DENTAL MEDICINE

Oral health assessment by plaque and gingival bleeding indices in a dental student cohort from Cluj-Napoca, Romania – a retrospective observational cross-sectional study

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Abstract

Background. Oral hygiene is a primary determinant of the two most prevalent oral diseases — dental caries and periodontal disease. Despite privileged access to oral health education and clinical services, dental students represent an under-studied population regarding objective clinical oral hygiene status. Population-level data using standardized clinical indices remain scarce for young adults in Romania.

Aim. To determine the prevalence of acceptable oral hygiene and healthy gingival status in a cohort of Romanian dental students, assessed by the O'Leary Plaque Control Record Index (PCR, threshold ≤20%) and the Ainamo & Bay Gingival Bleeding Index (GBI, threshold ≤10%). Secondary aims included evaluating arch-level and gender-related differences.

Methods. This retrospective cross-sectional observational study extracted data from patient files of dental students attending the Periodontology Department of the Stomatology Ambulatory of Cluj County Clinical Emergency Hospital — the teaching clinic of Iuliu Hatieganu University of Medicine and Pharmacy, Cluj-Napoca — between April 2024 and December 2025. Statistical analysis was performed using IBM SPSS v.27 (Welch's t-test; chi-square; α=0.05).

Results. 482 dental students were included (234F/248M; mean age 23.39 years). Mean PCR values were 29.43% (maxilla) and 32.83% (mandible); mean GBI values were 12.56% (maxilla) and 15.16% (mandible) — both exceeding acceptability thresholds. Only 21% met criteria for acceptable oral hygiene and gingival health across the full dentition. No gender-based differences were identified ($p \geq 0.05$).

Conclusions. A significant proportion of dental students fail to achieve acceptable plaque control and gingival health despite their educational background. These findings support the integration of structured, repeated oral hygiene self-monitoring into dental education curricula and provide baseline data for future interventional studies.

Keywords: oral health, oral hygiene, periodontal prophylaxis, dental students, dental indices

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Background and aims

Oral health is an integral part of overall health. It represents the well-being of the oral cavity and the surrounding structures, in functional and structural integrity. Oral health is intimately interlinked with proper oral hygiene. Good oral hygiene significantly impacts individuals, from general well-being to psychological aspects. A beautiful and healthy smile leads to self-satisfaction, social integration, and increased quality of life [1,2]. Additionally, oral hygiene can determine the success or failure of dental treatments. Unsatisfactory oral hygiene can result in the early loss of

dental units and functional impairment, thus affecting the dento-maxillary apparatus in all its complexity. The level of oral hygiene is a predictable determinant for the two most common oral conditions: cavities and periodontal disease [3,4]. It is estimated that 2.3 billion people suffer from untreated dental caries of permanent teeth, while periodontitis affects up to 50% of the global population. Both pose a significant burden on public health systems; however, both are treatable if detected early. Early detection significantly reduces treatment costs [5,6].

Dental indices can be used for early detection of dental and oral pathologies, pathologies' risk assessment and the longitudinal observation of oral health. Oral hygiene indices provide objective evaluations of the oral status and can be used by dental professionals to educate and motivate patients, to track compliance and to track changes in oral health status. O'Leary's Plaque Control Record index (PCR) (1972) is an objective method of assessing the presence of dental plaque, based on staining solutions to highlight plaque presence. Due to its visual impact, it is widely used to establish correct oral hygiene habits. A PCR value of ≤20% is considered indicative of an acceptable level of oral hygiene [7]. Ainamo & Bay's Gingival Bleeding Index (GBI-1975) determines the presence or absence of bleeding on probing (BOP). This type of index is compatible with O'Leary's PCR. Furthermore, this index is sufficient to establish the presence or absence of gingival inflammation [8]. Gingival health is defined by the lack of clinically detectable inflammation, highlighted by bleeding on probing (BOP) in less than 10% of the dental surfaces. This threshold level is also as compatible with clinical periodontal stability [9].

Globally, trends in dentistry shift towards prophylaxis and prevention, which are preferable to treatment. However, Romania is currently facing a lack of nationwide oral health prophylaxis programs, and deficiencies in oral health education. This is likely due to decreased state funding of the public health system, and increasing population-wide inequities in financial security, education levels and access to oral health. Dental healthcare is mostly private in Romania, with limited state-insured opportunities available for dental treatment. These facts translate into a high level of dental treatment needs presented by the Romanian population [10–12]. Furthermore, dental care is rarely a top priority for patients; most frequently, the high costs of oral healthcare prevent patients from considering dental treatment [11].

At the same time, this means limited population-wide data relating to the usage of plaque and gingival bleeding indices is currently available. Most of the available oral health data refer to pediatric populations; the existing studies on adult patients mainly investigate prevalence of dental caries (based on the Decayed, Missing, Filled Teeth - DMFT index) [10,13,14,15]. Therefore, oral hygiene studies addressed to the adult population are scarce; when referring to the young adult population, they are almost non-existent. While the relationship between poor oral hygiene and periodontal disease is well established, objective prevalence data documenting the actual proportion of young adults who fail to achieve acceptable plaque control and gingival health — using standardized clinical indices — remain limited for Romania. The present study does not aim to re-establish this known association, but to quantify its magnitude in a specific, under-represented population and provide a baseline for future preventive interventions.

The main aim of this study was to determine the prevalence of acceptable oral hygiene and healthy gingival status in a population of dental students from the Faculty of Dental Medicine in Cluj-Napoca, assessed by the O'Leary Plaque Control Index (PCR) and the Gingival Bleeding Index (GBI). Secondary aims included evaluating differences between the maxillary and mandibular arches and assessing potential gender-related differences in plaque accumulation and gingival bleeding.

Methods

This study was developed in conformity with the Declaration of Helsinki and in accordance with current local and European legislation on ethical research. The protocol and development of this study was approved by the Ethics Committee of Iuliu Haţieganu University of Medicine and Pharmacy, Cluj-Napoca (Nr. AVZ67/19.04.2024) and Cluj County Clinical Emergency Hospital Cluj-Napoca, Romania (Nr. Reg. 49053/19.10.2023, file 3363/2023). All included patients gave written informed consents for examination, treatment, data collection and publication of collected data.

This was a retrospective cross-sectional observational study. Data were extracted from existing records generated during routine clinical examinations at the Periodontology Department of the Stomatology Ambulatory of Cluj County Clinical Emergency Hospital Cluj-Napoca, Romania; no additional clinical procedures were performed for the purposes of this research. Data were retrospectively collected from patient files from 20.04.2024 to 31.12.2025. This study was developed in compliance with STROBE (Strengthening the Reporting of OBservational Studies in Epidemiology) guidelines [16].

Statistical analysis was performed using IBM SPSS Statistics, version 27. Descriptive statistics were calculated for all continuous variables and expressed as means, standard deviations, and 95% confidence intervals. Differences between genders were assessed using Welch's t-test for continuous variables due to unequal variances. Categorical variables were compared using the chi-square test. The level of statistical significance was set at $\alpha = 0.05$.

Population characteristics

Sample size was calculated a-priori using G*Power 3 software [17]. Calculation parameters were chosen for a simple cross-sectional prevalence study in the general adult

Romanian population, using confidence levels of 95% and 0.05 precision, with an expected prevalence of 17.5%. The expected prevalence is based on national estimates of severe periodontal disease in Romanian adults [10], which was adopted as a conservative proxy due to the lack of published prevalence data for gingivitis or poor oral hygiene in adult populations. This approach ensured an adequately powered sample for the descriptive and comparative analyses performed in this study. The estimated number of participants to be included for the study to be statistically significant was 222. We assumed a 10% rate of incomplete, missing or ineligible records, increasing the planned sample size to minimum 250 participants.

During the period of dental studies, dental students can benefit from oral health assessments in the Periodontology Department of the Stomatology Ambulatory of the Cluj County Clinical Emergency Hospital (the public teaching clinic of the Iuliu Haţieganu University of Medicine and Pharmacy, Cluj-Napoca - UMFIH). The study population consisted of dental students who benefited from oral health assessments using the Department's standardized protocols, based on PCR and GBI indices. This setting constitutes a relatively well-defined population in terms of age and educational background. As a clinic-based convenience sample, it may not be fully representative of the general young adult population in Romania; the applicability of these findings to populations outside the UMFIH student community should be interpreted with caution.

The following data were collected from the patient files to be included in the study: age, gender, PCR for maxilla and mandible and GBI for maxilla and mandible. Only records with complete data for all four index variables were included. The data were collected into a pre-defined form in Microsoft Office Excel. Graphics and descriptive statistics were made using the same software.

- **Inclusion criteria**

- Dental students enrolled at the Faculty of Dental Medicine, UMFIH Cluj-Napoca who presented for dental examinations in the Periodontology department;

- Patients who willingly completed all informed consent forms;

- Patients whose data was registered completely and accurately.

- **Exclusion criteria**

- Patients with mixed or temporary dentition, partially or fully edentulous patients;

- Patients under dental or periodontal treatment, or who have been instructed regarding oral hygiene in the last 3 months;

- Patients whose data were not registered completely and accurately, or who have not provided full consent.

Participant flow: Of all patients attending the Periodontology Department during the data collection period, those meeting the inclusion criteria and presenting no exclusion criteria were identified. Records with incomplete data for any of the four primary variables (PCR-maxilla, PCR-mandible, GBI-maxilla, GBI-mandible) were excluded, as were records of patients who were not dental students. A total of 482 patients' records (dental students) satisfied all criteria and constitute the final study sample.

Oral assessment protocols

Clinical examinations were performed by trained clinicians working within the Periodontology Department of the Stomatology Ambulatory of the Cluj County Clinical Emergency Hospital. All examiners followed the department's standardized examination protocol, which governs the sequence, instrumentation, and recording methodology for the PCR and GBI indices. Since the clinical examinations were conducted as part of routine departmental care — and data were subsequently collected retrospectively — formal pre-study examiner calibration in the traditional research sense was not applicable. Standardization was ensured through adherence to the departmental protocol.

Patients were examined by current protocols of the Department of Periodontology, using the department's standard patient file. An individual file was created for each patient. The file includes: the patient's general data, general health questionnaire, dental record, hygiene indices and periodontal chart, the record of treatments and interventions. The annexes that are attached to the patient records include: the patient's informed consent to the examination and treatment, consent to the processing of personal data, the General Data Protection Regulation (GDPR) consent, consent to the use of data for medical education, consent to the use of data for scientific research and eventual publication, the consent to take photographic documentation. Data for this study was collected retrospectively from patient files.

The oral hygiene and gingival status evaluation is normally initiated after the procedures are explained to the patient. The patients are not subjected to prior professional dental hygiene, and are asked not to rinse or otherwise clean their teeth before the assessment. O'Leary's PCR index is performed first, for the sake of objectivity: otherwise, bleeding may hide visible plaque deposits and wash away the staining substance used to perform the index, creating significant difficulties. The patients have all dental surfaces smeared with plaque revealing substance (Rondell Red Directa®). This product stains dental plaque in two tones: new plaque (adherent for less than 72 hours) is stained red, old plaque is stained blue. After staining, the patients are asked to rinse, in order to observe residual staining. The stained spots represent sites of plaque accumulation. The presence of dental plaque is visually assessed by inspection in four areas of each tooth present on the arch: mesio-vestibular, centro-vestibular, disto-vestibular and centro-oral. The presence of dental plaque is noted by the "+" sign, in the diagram corresponding to the PCR index. The next step consisted of calculating the PCR index for the

maxilla and for the mandible, by dividing the number of surfaces presenting plaque to the total number of surfaces examined. The results obtained are noted in the patient's file. The threshold for PCR index is ≤20%, meaning that below this value, the patient is considered to have an acceptable degree of oral hygiene, translating to reduced plaque deposits.

Before initiating GBI evaluation, abundant plaque deposits are mechanically removed to allow access to the gingival sulcus, by gentle scraping, removal with a cotton roll or rinsing. This step is limited to the removal of supragingival bulk plaque deposits sufficient to permit unobstructed access to the gingival sulcus; it does not constitute professional prophylaxis. This is a standard clinical procedure. Probing is initiated immediately thereafter, without delay. It is acknowledged that in cases of extremely heavy plaque accumulation, this removal step may have marginally influenced the recorded bleeding scores; this is noted as a methodological limitation. Sulcus probing is performed by inserting the periodontal probe up to almost the base of the sulcus, without exerting pressure and without touching the base of the sulcus, to prevent damage to the epithelial insertion of the superficial periodontium. The probe is inserted into the sulcus parallel to the axis of the tooth. The evaluation of bleeding and the recording of the results takes place 30 seconds after completion. The presence of bleeding is visually assessed by inspection, on four surfaces of each tooth: mesio-, centro- and disto-vestibular and centro-oral. The absence of bleeding is noted with the " – " sign, and its presence is noted with the "+" sign, in the GBI index evaluation chart on the form. The last stage consists of calculating GBI scores for the maxilla and mandible by dividing the number of surfaces presenting plaque to the total number of surfaces examined. The results were noted in the patient file. The threshold for GBI index is ≤10%, meaning that over this value, the patient is considered to present signs of gingival inflammation, translating to increased levels of gingival bleeding. Patients presenting with a value below threshold are considered to be gingivally healthy.

Results

A total number of 482 patients were included in this study. The achieved sample size (n=482) exceeded the a priori estimated minimum of 250 participants, ensuring adequate statistical power for the planned analyses. Out of the total study participants, 234 (48.54%) were female and 248 (51.45%) were male. The age mean was 23.39 years old for the whole population.

Mean PCR values for the entire study population were 29.43% for maxilla and 32.83% for mandible. Mean GBI values for the entire sample were 12.56% for maxilla and 15.16% for mandible. Mean values for indices separated by gender are presented in Table I. Males have slightly higher means for PCR than females, but the 95% CIs overlap considerably. Regarding GBI, males again show higher mean values. However, there were no statistical differences between mean values of PCR and GBI between the genders (Using Welch's t test (unequal variances) for each index, p≥0.05) (Table I).

Table I. Mean values of PCR and GBI divided by gender.

F			
Index	**Mean**	**SD**	**95% CI**
PCR mx	28.98%	21.02%	26.27% – 31.69%
PCR md	32.01%	21.57%	29.23% – 34.78%
GBI mx	11.45%	15.09%	9.51% – 13.40%
GBI md	14.39%	15.90%	12.34% – 16.43%
M			
Index	**Mean**	**SD**	**95% CI**
PCR mx	29.85%	21.53%	27.16% – 32.54%
PCR md	33.60%	23.34%	30.68% – 36.52%
GBI mx	13.61%	15.87%	11.63% – 15.60%
GBI md	15.89%	16.89%	13.78% – 18.01%
Differences between groups			
Index	**Mean F (%)**	**Mean M (%)**	**p value**
PCR mx	28.98	29.85	0.655
PCR md	32.01	33.6	0.435
GBI mx	11.45	13.61	0.126
GBI md	14.39	15.89	0.313

PCR Values interpretation

A patient is considered to have an acceptable degree of dental hygiene when PCR index value is ≤20%. The centralization and analysis of the collected data revealed average PCR values ≥20% for both genders (Table II). There was no statistically significant difference between the genders (chi-square test; p>0.05).

Table II. PCR values of study population.

Gender	n	PCR ≤ 20% in both arches	PCR ≤ 20% in Mx only	PCR ≤ 20% in Md only	PCR > 20% in both arches
F	234	73	25	18	118
M	248	68	26	15	139
Total	482	141 (29.25%)	51 (10.58%)	33 (5.84%)	257 (53.31%)

GBI Values interpretation

Periodontal health implies that bleeding on probing (expressed through the GBI index) is less than 10%. Analysis of collected data revealed average GBI values ≥10% for both genders, with a significant proportion being classified as patients presenting clinical signs consistent with gingival inflammation (either localized or generalized). There was no statistically significant difference between the genders (chi-square test; $p>0.05$) (Table III).

Table III. GBI values of study population.

Gender	n	GBI ≤10% in both arches	GBI >10% in one arch only	GBI >10% in both arches
F	234	99	59	76
M	248	102	48	98
Total	482	201 (41.7%)	107 (22.19%)	174 (36.09%)

Interpretation in the oral health context

A significant proportion of the study population presented values for either PCR or GBI above the accepted thresholds (51%); this indicates that oral hygiene was not within acceptable thresholds and/or gingival bleeding was present in either one of the arches. Only 21% of patients presented acceptable values for both indices, indicating acceptable oral hygiene and absent or reduced gingival bleeding in the whole mouth. Close to a third of the population (28%) presented significant plaque deposits and bleeding on probing. These patients can be considered patients presenting clinical signs consistent with plaque-induced gingival inflammation (either localized or generalized). A graphic representation is provided in figure 1.

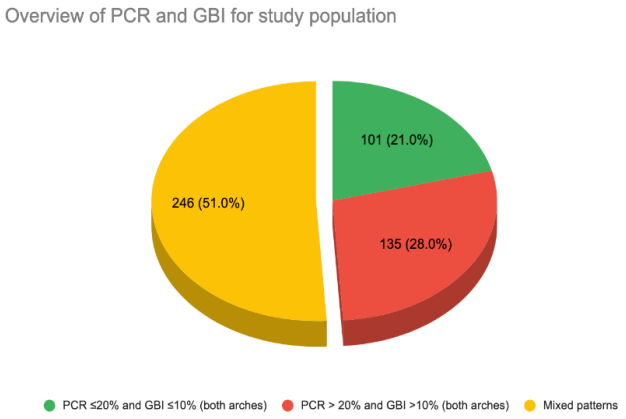

Figure 1. Pie graph representing the distribution of patients in relation to PCR and GBI index thresholds.

Discussion

This study provides an overview of the oral health status of a young adults population from Cluj-Napoca, Romania, who attended oral hygiene assessments at the Periodontology Department of the Stomatology Ambulatory of the Cluj County Clinical Emergency Hospital (the public teaching clinic of the Iuliu Haţieganu University of Medicine and Pharmacy, Cluj-Napoca - UMFIH). To the authors' knowledge, this is the largest sample of Romanian young adults recorded in an oral health study; therefore, the results of this study can provide valuable data for estimating the necessity for oral health-related interventions in young adults. The study does not aim to re-establish the well-known association between plaque accumulation and gingival inflammation, but to quantify — using objective validated indices — the proportion of young adults failing to achieve acceptable oral hygiene and gingival health in a population for which little prior published data exist.

Given that the study population consists of university-educated young adults in an urban setting, who theoretically have greater access to oral health information, the observed high prevalence of inadequate oral hygiene is particularly noteworthy and lends additional scientific and educational significance to the findings. This is particularly striking when considering that dental students are informed about oral healthcare routines and importance and can also benefit from treatment in the University setting. Furthermore, the vulnerability of young adults must be considered; from a dental point of view, early adulthood is a pivotal moment in which individuals must learn how to manage oral hygiene and build sustainable habits that will aid in the maintenance of their dentition throughout their life. Failure to do so may result in subsequent pathologies development, which may represent a substantial financial, psychological and physiological burden in later adulthood. According to the results obtained, it can be stated that the sample population has an unsatisfactory level of oral hygiene and does not fit the definition of periodontal health. Plaque presence leads to hard and soft tissue pathologies; since plaque accumulation precedes gingival inflammation, high plaque index scores can indicate a vulnerable periodontal state, unless rigorously controlled. Additionally, poor oral hygiene is known to favor the development of carious lesions, which are the most commonly identified dental pathology worldwide [6].

Although insufficient by itself to diagnose periodontal diseases, GBI is a representative index for periodontal health or lack thereof [18]. Its increased values in the study population highlight an urgent need for community-based oral health education and preventive interventions. The presence of high GBI along with high PCR index emphasizes the well-known relationship between biofilm formation and periodontal status; this indicates that most patients presented with clinical signs consistent with plaque-induced gingival inflammation [19].

Plaque-induced gingivitis is a site-specific inflammatory condition initiated by dental biofilm accumulation. Other forms of gingivitis may appear without depending on plaque levels but are less common [20,21]. Identification of gingivitis cases is essential, because gingivitis is the only reversible form of periodontal disease; failure to treat gingivitis may lead to periodontitis, which is characterized by irreversible clinical attachment loss. Periodontitis is a silent disease, and frequently asymptomatic. In incipient cases especially, it is common for only the gingival bleeding to manifest visibly, alerting the patient and the clinician [22]. Since periodontitis incidence increases with age, prophylaxis strategies addressed to younger populations are essential, because early implementation of oral hygiene habits can effectively prevent periodontal diseases [23,24]. In this particular setting, there seems to be a discrepancy between the oral health information available to dental students and incorporating the interventions into daily habits. Therefore, oral hygiene training and evaluation of hygiene effectiveness and patient compliance can be recommended, even in a previously trained community [25]. Dental indices can be used for re-assessments and for evaluating the subjects' compliance or treatment adherence [26,27].

The findings of this have practical implications on multiple levels. At the curricular level, we recommend the integration of PCR- and GBI-based self-assessment exercises in the dental curriculum, starting from the debut of pre-clinical dental training. This would aid dental students in self-identifying oral hygiene deficiencies, monitor their progress and build sustainable oral hygiene habits. These identification, monitoring and habit-building skills would be directly transferable to future patient education practice and management. Furthermore, the oral hygiene instruction of dental students using digital tools like the intraoral scanner or virtual reality glasses could be the fundament of further efficiency studies for these novel methods [28,29]. At the public health level, these data represent, to the authors' knowledge, the largest baseline dataset of objectively measured oral hygiene and gingival status in Romanian young adults using standardized clinical indices. As such, they provide a foundation for future community-based preventive programs and support the case for a nationally coordinated oral health surveillance strategy for young adults — a population currently underserved by Romania's existing oral health monitoring infrastructure.

Our study confirms the findings of previous similar studies conducted in Romania. A study conducted in Iasi, on 122 students of the Faculty of Dental Medicine, concluded that the majority of the sample did not present satisfactory levels of oral hygiene. Oral hygiene was assessed using the Approximate plaque index – API, revealing a sample mean of 72.71%. Optimal oral hygiene translates to an API index below 25% [30]. Another study carried out at the Faculty of Dental Medicine in Craiova investigated the oral hygiene of 92 students. Oral hygiene was assessed using the PCR index. The mean value of the O'Leary plaque index was 56.86% in smokers and 21.85% in non-smokers, indicating poor plaque control in both groups. This study revealed higher plaque index values for the male population [31]. The findings of our study are consistent not only with Romanian data but also with international studies investigating dental student populations. A study conducted at the University of Zagreb on 94 dental students of first and last years, reported a counterintuitive finding: while final-year students had significantly better oral health attitudes than first-year students, their plaque indices were actually higher, suggesting that academic progression in dentistry does not necessarily translate into improved personal plaque control [32]. A 2025 multicentric study across three Italian universities and the University of Lyon (France) reported a median baseline gingival bleeding score of 50.0% among 117 dental and dental hygiene students. This is a finding that confirms the prevalence of clinically significant gingival inflammation in European dental student populations [33]. A questionnaire-based study conducted in four Swiss universities concluded that only half of the dental students had a proper interdental cleaning routine frequency congruent with oral health recommendations [34]. However, these findings are not limited to Europe: a study on 108 first-year dental students from the University of Tokyo revealed that a considerable proportion presented with suboptimal oral health at the outset of their dental training, despite having already been accepted into a dental program. This suggests that pre-existing oral hygiene habits formed prior to university entry are not consistently adequate even in a highly academically selective cohort [35]. The results of the Tokyo study confirm the pattern observed in the present study. Furthermore, the conclusions of the aforementioned studies suggest that the knowledge–behavior discrepancy in dental student's oral hygiene is not geographically limited, but may represent a global phenomenon.

Several limitations of this study must be acknowledged. First, the use of a clinic-based convenience sample may introduce selection bias: individuals presenting for dental assessments at a teaching clinic may differ systematically from the broader young adult population in terms of oral health awareness, symptom burden, or health-seeking behavior. The findings should therefore be interpreted as reflective of dental students attending the UMFIH teaching clinic, rather than the general Romanian young adult population. Second, the retrospective design imposed inherent constraints: data were collected from routine clinical records, and the researcher had no control over examination conditions across all records. While standardization was ensured through adherence to the departmental protocol, formal pre-study examiner calibration was not performed in the traditional research sense. Third, and importantly, the dataset did not include behavioral variables — such as toothbrushing frequency, interdental cleaning habits, dietary patterns, smoking status, or systemic health conditions — all of which are

established determinants of plaque accumulation and gingival inflammation. The absence of these variables limits the ability to interpret the etiology of the observed findings beyond clinical description. Future prospective studies in this population should incorporate a standardized behavioral questionnaire alongside clinical index measurements. Finally, the lack of full periodontal diagnosis data (e.g., clinical attachment level, probing depth, radiographic bone levels) and specific indices such as ICDAS limits the scope of diagnostic inference that can be drawn from the dataset.

Information on the oral health status of the population is fundamental to dental public health practice. Public health surveillance is the continuous systematic collection, analysis, and interpretation of data for the planning, implementation, and evaluation of public health services. It is a system that uses methods that are fast, simple and practical, designed to put as little pressure as possible on the healthcare providers who make the report. As a result, the data are not as accurate as those collected under strict protocols in research projects with specific outcomes. However, the accuracy levels are considered sufficient to monitor the population and the incidence of pathologies. Therefore, the data provided by this study, albeit with a lower level of precision, can represent a starting point for a population-wide data collection on the basis of which appropriate public oral health measures can be established [36].

Conclusions

This study highlights the fact that a significant proportion of the dental students from Cluj-Napoca, Romania do not meet the established criteria for acceptable plaque control and gingival health. This is particularly striking when considering that this population has access to both oral healthcare information and treatment. The high prevalence of plaque accumulation and gingival bleeding highlights the need for structured preventive strategies targeting younger populations, including routine hygiene assessments and self-monitoring programs within dental education curricula. These findings support the integration of standardized oral hygiene indices into community-based and clinical preventive programs and provide baseline data for future intervention studies targeting dental and healthcare students in Romania.

Institutional Review Board Statement

The study was conducted in accordance with the Declaration of Helsinki, local and European laws and regulations concerning scientific medical research. Ethical review and approval were obtained from Iuliu Haţieganu University of Medicine and Pharmacy, Cluj-Napoca (Nr. AVZ67/19.04.2024) and Cluj County Clinical Emergency Hospital Cluj-Napoca (Nr. 49053/19.10.2023, file 3363/2023).

References

1. Scrine C, Durey A, Slack-Smith L. Enhancing oral health for better mental health: Exploring the views of mental health professionals. Int J Ment Health Nurs. 2018;27:178-186. doi: 10.1111/inm.12307.
2. Settineri S, Rizzo A, Liotta M, Mento C. Clinical Psychology of Oral Health: The Link Between Teeth and Emotions. Sage Open. 2017;7:1–7. doi:10.1177/2158244017728319.
3. Kocher T, Meisel P, Baumeister S, Holtfreter B. Impact of public health and patient-centered prevention strategies on periodontitis and caries as causes of tooth loss in high-income countries. Periodontol 2000. 2025;98:65-99. doi: 10.1111/prd.12592.
4. Seuntjens MT, Thomassen TMJA, Van der Weijden FGA, Slot DE. Plaque scores after 1 or 2 minutes of toothbrushing A systematic review and meta-analysis. Int J Dent Hyg. 2025;23:614-624. doi: 10.1111/idh.12840.
5. Nascimento GG, Alves-Costa S, Romandini M. Burden of severe periodontitis and edentulism in 2021, with projections up to 2050: The Global Burden of Disease 2021 study. J Periodontal Res. 2024;59:823-867. doi: 10.1111/jre.13337.
6. GBD 2017 Oral Disorders Collaborators; Bernabe E, Marcenes W, Hernandez CR, Bailey J, Abreu LG, et al. Global, Regional, and National Levels and Trends in Burden of Oral Conditions from 1990 to 2017: A Systematic Analysis for the Global Burden of Disease 2017 Study. J Dent Res. 2020;99:362-373. doi: 10.1177/0022034520908533.
7. O'Leary TJ, Drake RB, Naylor JE. The plaque control record. J Periodontol. 1972;43:38. doi: 10.1902/jop.1972.43.1.38.
8. Ainamo J, Bay I. Problems and proposals for recording gingivitis and plaque. Int Dent J. 1975;25:229-35.
9. Sanz M, Herrera D, Kebschull M, Chapple I, Jepsen S, Beglundh T, et al. Treatment of stage I-III periodontitis-The EFP S3 level clinical practice guideline. J Clin Periodontol. 2020;47 Suppl 22:4-60. doi: 10.1111/jcpe.13290. Erratum in: J Clin Periodontol. 2021;48:163. doi: 10.1111/jcpe.13403.
10. World Health Organization. Oral Health Romania 2022 country profile. Available from: https://www.who.int/publications/m/item/oral-health-rou-2022-country-profile
11. Oancea R, Amariei C, Eaton KA, Widström E. The healthcare system and the provision of oral healthcare in European Union member states: Part 5: Romania. Br Dent J. 2016;220:361-366. doi: 10.1038/sj.bdj.2016.265.
12. Cuculescu M, Slusanschi O, Boscaiu VR, Luis HPS, Fernandes Ribeiro Graça SM, Ramos Esteves Gonçalves Dos Santos Albuquerque, et al. Self-reported oral health-related habits, attitudes and knowledge in adults from Portugal, Romania and Sweden-A comparative study. Int J Dent Hyg. 2019;17:359-368. doi: 10.1111/idh.12408.
13. Cărămidă M, Furtunescu F, Ciobanu M, Păunescu B, Zamfirescu R, Dușa A, Iepure M. BAROMETRUL SĂNĂTĂȚII ORALE Studiu național realizat la inițiativa Colegiului Medicilor Stomatologi din România (CMSR), cu sprijinul Asociației Române pentru Promovarea Sănătății (ARPS). [Internet][cited 2026 Jan 27]. cmsr.ro/wp-content/uploads/2024/06/CMSR-Studiu-național-asupra-sănătății-oro-dentare-a-românilor-1.pdf

14. National Public Health Institute. Oral Health. [Romanian] Available from: https://insp.gov.ro/centrul-national-de-evaluare-si-promovare-a-starii-de-sanatate-cnepss/starea-de-sanatate/boli-netransmisibile/sanatate-orala/
15. Funieru C, Klinger A, Băicuș C, Funieru E, Dumitriu HT, Dumitriu A. Epidemiology of gingivitis in schoolchildren in Bucharest, Romania: a cross-sectional study. J Periodontal Res. 2017;52:225-232. doi: 10.1111/jre.12385.
16. STROBE - Strengthening the reporting of observational studies in epidemiology. Available from: https://www.strobe-statement.org/
17. Faul F, Erdfelder E, Lang AG, Buchner A. G*Power 3: a flexible statistical power analysis program for the social, behavioral, and biomedical sciences. Behav Res Methods. 2007;39:175-191. doi: 10.3758/bf03193146.
18. Tonetti MS, Greenwell H, Kornman KS. Staging and grading of periodontitis: Framework and proposal of a new classification and case definition. J Clin Periodontol. 2018;45 Suppl 20:S149-S161. doi: 10.1111/jcpe.12945. Erratum in: J Clin Periodontol. 2019;46:787. doi: 10.1111/jcpe.13152.
19. Carvalho AP, Moura MF, Costa FO, Cota LO. Correlations between different plaque indexes and bleeding on probing: A concurrent validity study. J Clin Exp Dent. 2023;15:e9-e16. doi: 10.4317/jced.60039.
20. Trombelli L, Farina R, Silva CO, Tatakis DN. Plaque-induced gingivitis: Case definition and diagnostic considerations. J Clin Periodontol. 2018;45 Suppl 20:S44-S67. doi: 10.1111/jcpe.12939.
21. Holmstrup P, Plemons J, Meyle J. Non-plaque-induced gingival diseases. J Clin Periodontol. 2018;45 Suppl 20:S28-S43. doi: 10.1111/jcpe.12938.
22. Kurgan S, Kantarci A. Molecular basis for immunohistochemical and inflammatory changes during progression of gingivitis to periodontitis. Periodontol 2000. 2018;76:51-67. doi: 10.1111/prd.12146.
23. Wen X, Li H, Li S, Chang B, Chen S, Li H, et al. Associated factors of periodontitis and predicted study among young man in China: a population-based cross-sectional study. BMC Public Health. 2024;24:1235. doi: 10.1186/s12889-24-18732-2.
24. Seow LL, Mendoza MAF, Tadjoedin FM, Feng SW, Pongprueksa P, Truong LV, et al. Integrated Strategies for Early Diagnosis and Prevention of Oral Diseases in Asia Pacific. Int J Environ Res Public Health. 2025;22:1737. doi: 10.3390/ijerph22111737.
25. Roman A, Șoancă A, Petruțiu Ștefan A, Condor D, Cioban C. Parodontologie 2: Ghid de tratament. [Periodontology 2: therapeutic guidelines] ed. 2. Cluj-Napoca: Editura Medicală Universitară Iuliu Hațieganu; 2018.
26. Bush Gissler B, Kroeger A, Würfl G, Mombelli A, Sculean A, Kebschull M. Does Patient Adherence Influence the Ability of Supportive Periodontal Therapy to Maintain Stability Around Teeth and Dental Implants - A Systematic Review. Oral Health Prev Dent. 2025;23:615-627. doi: 10.3290/j.ohpd.c_2314.
27. Costa FO, Cortelli SC, Costa AA, Cyrino RM, Cortelli JR, Miranda Cota LO. Impact of compliance during periodontal maintenance therapy on oral health-related quality of life: A 6-year follow-up. J Dent. 2019;83:50-55. doi: 10.1016/j.jdent.2019.02.009.
28. Lanzetti J, Ferrati F, Crupi A, Gibello U, Roccuzzo A, Pera F. Enhanced efficacy of oral hygiene instructions during motivational interviewing using intraoral scanner technology: a randomized clinical trial. Clin Oral Investig. 2026;30:189. doi: 10.1007/s00784-026-06867-y.
29. Kwon HJ, Ryu SH, Choi EJ, Lee JA, Kim SJ, Cho HJ. Effectiveness of virtual reality-based toothbrushing instruction on oral health outcomes: A randomized controlled trial. Clin Oral Investig. 2026;30:129. doi: 10.1007/s00784-026-06819-6.
30. Balcoș C, Dănilă I, Săveanu CI. Studiu comparativ privind starea de sănătate parodontală prin prisma indicilor de placă si gingivali [Comparative study on the periodontal health status trough plaque and gingival index]. Rev Med Chir Soc Med Nat Iasi. 2010;114:1184-1187.
31. Bataiosu M, Tuculina M, Diaconu O, Andrei V. [Evaluation of risk factors with the role on the onset of marginal periodontitis in adults]. Craiova Medicala, 2008;10(3). Romanian. Available from: https://new.umfcv.ro/ro/despre-noi/reviste-umf-craiova/craiova-medicala/chsj-arhiva/2008/vol-10-nr-3-2008/evaluarea-unor-factori-de-risc-cu-rol-n-debutul-parodontitei-marginale-a-adultului
32. Lujo M, Meštrović M, Ivanišević Malčić A, Karlović Z, Matijević J, Jukić S. Knowledge, Attitudes and Habits Regarding Oral Health in First- and Final-Year Dental Students. Acta Clin Croat. 2016;55:636-643. doi: 10.20471/acc.2016.55.04.15.
33. Mazur M, Vitiello F, Ndokaj A, Izzetti R, Tosco V, Corridore D, et al. Improved Plaque-Induced Gingivitis in Students Using Calibrated Interdental Brushes: Results of a 3-Month Multicenter Educational Intervention. J Clin Med. 2025;14:5738. doi: 10.3390/jcm14165738.
34. Hofer D, Gartenmann SJ, Wiedemeier DB, Attin T, Schmidlin PR. The effect of clinical education on optimizing self-care by dental students in Switzerland. Swiss Dent J. 2022;132:170-177. doi: 10.61872/sdj-2022-03-01.
35. Suzuki H, Sugimoto K, Kubota-Miyazawa A, Noritake K, Umemori S, Araki K, et al. A survey of oral health status, subjective oral symptoms and oral health behaviors among first-year dental students at a Japanese university. J Oral Sci. 2022;64:85-90. doi: 10.2334/josnusd.21-0420.
36. Amer Assoc of Public Health Dentistry. Burt and Eklund's Dentistry, Dental Practice, and the Community. 7th ed. Mascarenhas AK, Okunseri C, Dye B editors. Elsevier Health Sciences; 2021.