Are There Differences between Partial and Total Periodontal Examination of the Mouth?

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Abstract

Background: Diagnosis of periodontal disease for epidemiologic survey is difficult due to complexity of periodontal exam. The aim of this study was to compare data from a full-mouth examination and a partial-mouth examination, observing the agreement between both methods of presenting the Community Periodontal Index (CPI).

Methods and Findings: The population comprised of male and female subjects, aged 18 years and over, attending public health centers in the city of Recife, Brazil. A total of 505 patients participated in this study. Each participant completed a form and underwent periodontal examination. Firstly, for each tooth present one of the periodontal conditions was determined: periodontal health, gingival bleeding, dental calculus, shallow periodontal pockets and deep periodontal pockets, according to CPI. Finally, partial data (10 index teeth) was recorded derived from the total version of CPI. Bivariate analysis of frequencies and means was performed. McNemar test was used to calculate the level of statistical significance of the association tested. There are significant statistical differences between partial and full-mouth examination (p<0.001). According to gender, men classified as score 1 presented the same prevalence in both methods; partial recording overestimated 0.2% of women classified as score 1; percentile difference among men was higher for subjects classified as score 0. Among subjects with at least one tooth with deep periodontal pocket, percentile difference between different approaches was higher among elders (60 years and over).

Conclusions: Considering the variable age, the smaller amount of lost information refers to periodontal pockets in individuals aged 18 to 30 years of age. In older individuals classified as periodontally healthy...
Introduction

Epidemiology is primarily concerned with the prevalence of diseases, and the determinants of health and disease in populations [1]. Epidemiological studies on periodontal conditions are of great importance, because they are critical in the planning of oral health care policies and the implementation of dental services. A large number of studies use full-mouth examination, but when we consider the time, logistics, and cost constraints involved in this approach, its use in epidemiological studies for assessing periodontal status in large populations is not always feasible [2], so partial screening protocols have been developed and used to characterize the periodontal status of subjects and populations [3].

To measure the events related to health and disease, epidemiology uses a number of indexes developed specifically for that purpose. In periodontal studies, indexes must be able to evaluate the clinical condition of the periodontium, thereby providing a guide to possible treatment. Many indexes are used in epidemiological studies, such as Russell’s Index [4], Simplified Oral Hygiene Index [5], Periodontal Disease Index [6], Extent and Severity Index [7] and the Community Periodontal Index Need for Treatment (CPITN) [8] which was changed to the Community Periodontal Index (CPI) [9]. The CPI is an index widely recommended because it is easy to use and it has been adopted throughout the world, thus allowing international comparisons to be made [10]. This index was proposed by Ainamo et al. [8], and has been implemented in several studies [11-15]. In 1997 it was recommended by the World Health Organization, no longer in relation to treatment needs, but as a simple internationally uniform index, now modified and known as the CPI [9]. This change to the CPI was the result of a more thorough understanding of periodontal disease today, in particular its multifactorial and complex etiology [15]. The partial version uses a 10-tooth index, divided into six sextants, as the basic unit for the examination and recording of periodontal status. Only the worst condition revealed on a sextant is recorded. Such index is therefore based on a hierarchical concept of progression of periodontal diseases [10, 16].

Because of possible discrepancies that may occur between the evaluations that use partial recordings and full-mouth recordings, the method that uses only the tooth index is questioned by some authors [2, 12, 17-21]. The partial methods may be able to reduce costs and save time in epidemiological studies. However, there is still no consensus among authors as to which the best method, if partial is or full-mouth examination [2].

Keywords
Adult; Dental Calculus; Periodontal Diseases; Periodontal Index; Periodontal Pockets.

and with gingival bleeding no loss of information was observed. Partial examination of the mouth underestimated the presence of periodontal pockets and overestimated the presence of calculus and bleeding. A high concordance between the partial and total examination was observed.
The relative efficiency or loss of information that results from partial periodontal examination methods remains unclear and poorly defined. The aim of the present study was to compare data from a full-mouth examination and a partial-mouth examination method (assessing only the index teeth: #17 and #16, #11, #26 and #27, #36 and #37, #31, #46 and #47), observing the agreement between both methods of presenting the CPI, and its relation to the sex and age variables.

Materials and Methods

Subjects
The present study was carried out in the city of Recife, Brazil. The study population comprised 505 subjects (100 male and 405 female), aged 18 years and over (18 to 30 years = 42.6%; 31 to 59 = 50.5%; 60 years and over = 6.9%). A list of all public health centers providing dental services was obtained from the Recife Department of Health, and 13 of these, representing approximately 20% of the total, were randomly selected. The sample size was calculated using a standard error of 5.0%. A confidence interval of 95% was used for calculating the sample. The minimum sample size was 461 subjects. The participants were randomly selected, from a list of all patients seen routinely on the day of the visit at each public health center selected. The inclusion criteria used were as follows: participants had to be dentate, with at least 2 teeth per sextant that were not indicated for extraction, nonsmokers, no periodontal treatment for at least the past six months, 18 years of age or over, with no systemic diseases, who agreed to participate in the investigation. Patient data were collected by means of a form, containing in addition to identification information, socioeconomic and demographic data. The instruments used in the examination included a dental mirror and a 0.5-mm ball-ended probe with a black band measuring between 3.5 and 5.5 mm (WHO 621, Trinity, Paraná, Brazil).

Each patient that agreed to participate in the study signed an informed consent form. The present research project was duly approved by the Ethics Committee of the Federal University of Pernambuco.

Clinical examination
Each patient was examined by one trained and calibrated examiner (RSC). Inter-examiner calibration with a gold standard dentist (RC) was assessed prior to data collection. The kappa (score) value was 0.82, indicating wide agreement. In addition, intra-examiner agreement was obtained during data collection in a cohort of 10% of the subjects and the same kappa value was observed (0.82).

Initially, in agreement with the CPI criteria, recommended by the WHO, the mouth was divided into six sextants: sextant 1, sextant 2, sextant 3, sextant 4, sextant 5 and sextant 6, and all teeth present were examined. The probe was introduced gently into the sulcus at three different sites (mesial, central and distal) on both the buccal and lingual surfaces of each tooth. No attempts were made to remove any calculus present prior to the recordings of pocket depths. For each tooth present in each individual one of the following conditions was determined: presence of periodontal health (score 0); gingival bleeding (score 1); supra or subgingival calculus (score 2); shallow periodontal pockets - 4 to 5 mm (score 3); or deep periodontal pockets – 6 mm and over (score 4). Based on these recommendations, in the present study, the highest score observed in each sextant was recorded as the sextant score, and the highest score of all sextants of a patient was recorded as the subject’s score. If less than two functional teeth were present, this sextant was excluded from the scoring (i.e. sextant was not considered for the highest score choice). Finally, partial data was recorded derived from the above mentioned total version of the CPI. This examination consisted of examining ten index teeth (#16 and #17, #11, #26 and #27, #36 and #37, #31, #46 and #47), distri-
but ed in six sextants. For this index, molars are examined in pairs and the highest score is recorded for each sextant. If none of the index teeth is present in the sextant, all the teeth remaining in the sextant are examined.

**Statistical analysis**

The data was analyzed using SPSS version 13.0 (SPSS Inc, Chicago, IL, USA) to compute frequencies and means for bivariate analysis. The McNemar test was used in calculating the level of statistical significance of the association tested. The level of statistical significance was set at P < 0.05.

**Results**

A total of 524 subjects participated in this cross-sectional comparative study, but 19 were excluded due to incomplete information and mistakes made by the recorder. Of the 505 patients comprising the final sample, 405 (80.2%) were female and 100 (19.8%) were male. The age range was from 18 to 85 years, with a mean age of 35.86 years.

**Table 1** shows a comparison between the two different methods of assessing periodontal conditions, partial-mouth and full-mouth examinations. This table shows that the distribution of scores of the partial and the whole dentition recordings were statistically different (P<0.001). The difference was more pronounced for score 0 (3.0%). Periodontal health, presence of gingival bleeding and calculus were overestimated and periodontal pockets were underestimated in the partial-mouth examination. Apart from the statistical difference between the different methods, it can be seen that the percentages of subjects with gingival bleeding and calculus are fairly similar.

**Table 2** shows that individuals classified as score 0 in the partial-mouth examination, did not present any severe periodontal alterations, such as periodontal pockets when submitted to the full-mouth examination. Among the individuals classified as score 2, partial examination, only 4.8% showed periodontal pockets when the whole mouth was examined.

Comparing the full-mouth examination with the partial examination, 469 (92.8%) of 505 subjects

<table>
<thead>
<tr>
<th>Partial-mouth Examination</th>
<th>Score 0</th>
<th>Score 1</th>
<th>Score 2</th>
<th>Score 3</th>
<th>Score 4</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td>N</td>
<td>%</td>
<td>N</td>
<td>%</td>
<td>N</td>
<td>%</td>
<td>N</td>
</tr>
<tr>
<td>Score 0</td>
<td>44</td>
<td>81.5</td>
<td>6</td>
<td>11.1</td>
<td>4</td>
<td>7.4</td>
</tr>
<tr>
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<td>-</td>
<td>-</td>
<td>45</td>
<td>86.5</td>
<td>6</td>
<td>11.5</td>
</tr>
<tr>
<td>Score 2</td>
<td>-</td>
<td>-</td>
<td>297</td>
<td>95.2</td>
<td>12</td>
<td>3.8</td>
</tr>
<tr>
<td>Score 3</td>
<td>-</td>
<td>-</td>
<td>73</td>
<td>94.8</td>
<td>4</td>
<td>5.2</td>
</tr>
<tr>
<td>Score 4</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>10</td>
<td>100.0</td>
</tr>
<tr>
<td>Total</td>
<td>505</td>
<td>100.0</td>
<td>505</td>
<td>100.0</td>
<td>505</td>
<td>100.0</td>
</tr>
</tbody>
</table>

*: Classification according to the highest score presented by the patient: score; 0: periodontally healthy; score 1: presence of gingival bleeding; score 2: presence of calculus; score 3: presence of shallow pockets; score 4: presence of deep pockets.
were classified in the same category according to the CPI system. In order to observe the coincidence among the two methods a weighted kappa was obtained. The Kappa value was 0.9, considering a confidence interval of 95%, ranging from 0.86 to 0.93.

The prevalence estimates for periodontal status from the different approaches according to sex are presented in Table 3. The results show that in both approaches the prevalence of individuals classified as score 3 or 4 were higher in males than in females. When the partial-mouth and full-mouth approaches were compared, the percentile difference among men was higher for subjects classified as score 0 or periodontally healthy (19.0% vs. 16.0%). Men classified as score 1 presented the same prevalence in the partial and full-mouth examinations. Among women the highest percentile difference was for shallow pockets or score 3 (12.8% vs. 14.8%).

According to age group, for the status of periodontal health, overestimation was greater in individuals aged from 31 to 59 years. In the younger age group (18 to 30 years), the partial examination overestimated the prevalence of periodontal health and gingival bleeding and underestimated individuals with a more severe periodontal status (calculus, shallow pockets and deep pockets). Also in the partial examination, calculus was underestimated in individuals aged 18 to 30 years and overestimated in individuals aged 31 years and over (Table 4).

Table 5 shows the periodontal status of the sextants examined according to partial-mouth (CPI index teeth) and full-mouth examinations. Calculus was the most prevalent condition in both examinations. The number of sextants recorded as periodontally healthy was overestimated when examinations were based on the 10 CPI index teeth, whereas the number of sextants with periodontal alterations (gingival bleeding, calculus and periodontal pockets) was underestimated when compared to the full-mouth examination. The largest percentile difference between the different approaches was

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### Table 3.

<table>
<thead>
<tr>
<th>Gender</th>
<th>Score 0</th>
<th>Score 1</th>
<th>Score 2</th>
<th>Score 3</th>
<th>Score 4</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Index</td>
<td>All</td>
<td>Index</td>
<td>All</td>
<td>Index</td>
<td>All</td>
</tr>
<tr>
<td></td>
<td>%</td>
<td>%</td>
<td>%</td>
<td>%</td>
<td>%</td>
<td>%</td>
</tr>
<tr>
<td>Male</td>
<td>19.0</td>
<td>16.0</td>
<td>5.0</td>
<td>5.0</td>
<td>48.0</td>
<td>49.0</td>
</tr>
<tr>
<td>Female</td>
<td>8.6</td>
<td>6.9</td>
<td>11.6</td>
<td>11.4</td>
<td>65.2</td>
<td>63.7</td>
</tr>
</tbody>
</table>

*: Classification according to the highest score presented by the patient: score; 0: periodontally healthy; score 1: presence of gingival bleeding; score 2: presence of calculus; score 3: presence of shallow pockets; score 4: presence of deep pockets.

### Table 4.

<table>
<thead>
<tr>
<th>Age group years</th>
<th>Score 0</th>
<th>Score 1</th>
<th>Score 2</th>
<th>Score 3</th>
<th>Score 4</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Index</td>
<td>All</td>
<td>Index</td>
<td>All</td>
<td>Index</td>
<td>All</td>
</tr>
<tr>
<td></td>
<td>%</td>
<td>%</td>
<td>%</td>
<td>%</td>
<td>%</td>
<td>%</td>
</tr>
<tr>
<td>18 to 30</td>
<td>10.7</td>
<td>9.3</td>
<td>17.7</td>
<td>16.3</td>
<td>60.0</td>
<td>61.4</td>
</tr>
<tr>
<td>31 to 59</td>
<td>10.2</td>
<td>7.5</td>
<td>5.5</td>
<td>6.3</td>
<td>61.2</td>
<td>58.8</td>
</tr>
<tr>
<td>60 and over</td>
<td>14.3</td>
<td>14.3</td>
<td>-</td>
<td>-</td>
<td>77.1</td>
<td>71.4</td>
</tr>
</tbody>
</table>

*: Classification according to the highest score presented by the patient: score; 0: periodontally healthy; score 1: presence of gingival bleeding; score 2: presence of calculus; score 3: presence of shallow pockets; score 4: presence of deep pockets.
4.5%, for score 0 or health sites; the lowest percentage difference was 0.2%, for the deep pockets condition, followed by shallow pockets and gingival bleeding (1.2%).

Discussion

The main purpose of the present study was to compare the results of the two different approaches to assess periodontal status, namely the partial and full-mouth examinations considering the CPI system recommended by the WHO [9], in a Brazilian adult population.

Present data suggests that there was indeed a degree of information loss when periodontal health was the main focus of interest of the study, with differences between the prevalence obtained using the partial and full-mouth examinations, as described above.

Recordings of clinical attachment level and or assessment of bone level on roentgenograms are regarded as the most valid expressions of periodontal status. However, very few representative epidemiological studies in Latin America have employed these criteria. The most common description used is the CPITN [8], which is the method recommended by WHO for population screening purposes [9]. This index has been criticized for not describing the periodontal status accurately [1, 22-24], and for the inherent hierarchy of the index not being valid for all populations, particularly regarding the relationship between gingivitis and calculus [19, 25].

Regarding the periodontal status of the entire sample of the present study, the statistically significant difference between partial and whole-mouth examinations is in agreement with Moimaz et al. [14], conducted with adolescents, and with a study performed in Brazil [2]. Despite the present result, it must be remembered that only 7.2% of the sample was classified in different categories when the partial and full-mouth methods were applied.

When total sample data is considered, it is important to analyze the prevalence of individuals classified as scores 3 or 4 (periodontal pockets) in the partial examination. This low prevalence may be due to the fact that the examination included only the index teeth, and a substantial proportion of individuals with pockets may have remained undetected.

When it comes to the variable sex, the highest percentile difference among men classified as score 0 can be explained by the fact that, bearing in mind that the full-mouth examination is more specific than the partial mouth one, and that men present deficient oral hygiene and a high prevalence of severe periodontal destruction, a large number of men were detected as having periodontal alterations. According to sex when the presence of gingival bleeding was analyzed in both methods, the partial examination showed satisfactory results for both males and females, these data corroborate other [10].

Finally, according to age group and the relationship between partial and full-mouth approaches, this study showed that measurements on ten index teeth yield more accurate estimates of the percentage of subjects aged 18 to 30 years classified as scores 3 or 4 and of subjects aged 60 years
and over classified as periodontally health, these groups had shown the lowest percentile difference between the two methods. The prevalence of periodontal pockets (scores 3 and 4) was underestimated by the CPI index teeth for all age groups, corroborating the findings of Baelum et al. [16] when the index was applied to shallow pockets. Overall, the percentage of score 2 as the maximum score recorded on the examinations was overestimated by the partial examination for subjects aged 31 years and over, but not for the younger subjects. The present results are very similar to that of Baelum et al. [16] and other epidemiological studies that showed a higher prevalence of calculus when compared to severe periodontal conditions (periodontal pockets) in younger patients [11, 14, 15, 26].

Some indexed studies [27, 28] have shown that dental caries and periodontal diseases are a public health problem and the main causes of tooth loss. The data of the present study show a higher number of subjects aged 60 years and over classified as score 0, when compared with the other age groups. This can be accounted for early tooth loss due to severe periodontal disease or dental caries in this age group and, consequently, the low number of teeth examined by the CPI system [16].

The observation that the CPI partial recordings overestimated periodontal health and underestimated periodontal alterations was demonstrated previously [12]. The focus of the present study is not on the weaknesses of the partial CPI examination method in epidemiological surveys, but on which periodontal conditions can be correctly measured by this partial examination method, thus despite the limitations of the CPI system, there is no partial index that can replace it for the assessment of periodontal status in epidemiological surveys [2].

Oral public health systems rely on the results of epidemiological studies for identifying the populations with periodontal problems, because the data are also used for developing public health policies.

In the population examined in Recife, Brazil, the percentile difference between the different approaches was lower among men. Considering the variable age, the smaller amount of lost information refers to periodontal pockets in individuals aged 18 to 30 years. As far as periodontal health and gingival bleeding in the older individuals (60 years and over) are concerned, no loss of information was observed.

**Conclusion**

Partial examination of the mouth tended to underestimate the presence of periodontal pockets and overestimate the presence of calculus and bleeding, however a high concordance between the partial and total examination was observed.

**Acknowledges**

This research was supported by CAPES, Brazil.

**Conflict of interest**

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

**References**


