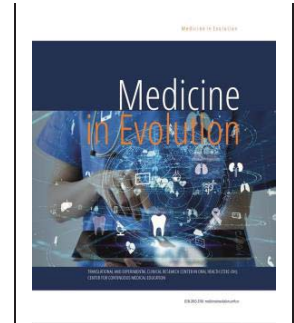# An analysis of how plaque-induced gingivitis can be measured in epidemiological studies

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Abstract

Aim and objectives: The study shows an analysis of how gingivitis can be measured in epidemiological studies, especially when prevalence is the main target; Material and methods: 1595 pupils from Bucharest schools were clinical investigated in order to find the oral health status. The schoolchildren were randomly selected and grouped into clusters. The gingivitis was measured using Silness and Löe gingival index (GI) and bleeding on probing – BOP, respectively; Results: %BOP > 0 was 37% and had a higher percent for the maxillary arch; Conclusions: BOP has more obvious clinical criteria but GI can lead to a prevalence of gingivitis closer to reality.

Keywords: children, gingivitis, epidemiology

INTRODUCTION

Plaque-induced gingivitis represents a chronic gingival inflammation produced by the common dental plaque [1]. The presence of oral microbiota in the gingival sulcus is responsible for the pathologic changes in gingivitis. The amount of dental plaque and her interaction with the host lead to different stages of gingivitis: stage I – *the initial lesion*, where only vascular changes are present and no clinical signs; stage II – *the early lesion*, where a clinical erythema can be present; stage III – *the established lesion*, a real and visible inflamed gingiva and stage IV – *the advanced lesion*, when inflammation is extended to the alveolar bone and is more like a periodontal breakdown than a gingivitis [2].

The plaque-induced gingivitis is completely reversible if the oral hygiene rules are applied. If not, long term gingivitis can lead to periodontal disease and the treatment becomes more complex.

Aim and objectives

When the patient comes for a dental appointment, it can be very easy for the dentist to identify the plaque-induced gingivitis in a simple clinical exam. However, when the examiner is an investigator in a clinical (epidemiological) study, things get more complicated because of the high number of peoples who need to be investigated, short time for every clinical exam and the way gingivitis is measured according to the clinical protocol. There are many ways and clinical scores for measuring gingivitis in epidemiological studies and this raises some questions when comparing results from different studies that use different methods for measuring plaque-induced gingivitis. The aim of this study is to make an analysis of how gingivitis was measured in an epidemiological study in Bucharest, Romania.

MATERIAL AND METHODS

This analysis is based on data from the PAROGYM study. The study involved 1595 pupils aged 11 to 14 years from 56 different Bucharest schools. Other results related to caries, gingivitis and teeth eruption were already published [3-6].

The sample was drawn from the total of 58,000 Bucharest schoolchildren population from 5th to 8th grade (data from 2008) and built on clusters using the EpiInfo software (Centers for Disease Control and Prevention, Atlanta, GA, USA). The sample characteristics were: 50% assumed prevalence of gingivitis, 95% confidence interval and a 2.4 estimation error. We used classes as clusters in a single-stage cluster sampling method. The children were stratified by city regions, grades, and the presence (or not) of a dental unit in schools.

The data were analysed using the SPSS processor, software version 24 (IBM, Armonk, NY, USA).

The clinical protocol and the informed consent form were approved by the Ethics Committee of "Carol Davila" University of Medicine and Pharmacy. Every schoolchild enrolled in the study had an informed consent signed by one of the parents.

Plaque-induced gingivitis was measured using both, Silness and Löe gingival index (GI), including score 1 (erythema) for all teeth and gingival surfaces (except third molars) and bleeding on probing (BOP). The gingival scores are the following [7]:
-   0: healthy gingiva
-   1: mild inflammation (discrete changes in colour, slight edema; no bleeding on probing)
-   2: moderate inflammation (the colour turs to red, edema, and glazing; bleeding on probing)

- 3: severe inflammation (marked redness and edema, ulceration; tendency to spontaneous bleeding)

The BOP technique was used only for 326 pupils and then was abandoned due to the lack of time. BOP was performed by insertion a Goldman–Fox/Williams D/E periodontal probe at the base of gingival sulcus (Fig. 1 and 2). Gingival enlargements or periodontal pockets were also measured (Fig. 3).

Figure 1 and 2. BOP technique

Figure 3. Periodontal pocket measurement

A several minutes pause was taken between both evaluation, GI and BOP.

RESULTS

The BOP results are shown in the table no.1.

Table 1. BOP results

BOP		
	No. cases	Percent
BOP = 0	205	62.9%
BOP > 0	121	37.1%
Total	326	100%

The maxillary and mandibular values of the BOP are graphically exposed in figures 4 and 5.

Maxillary BOP

Figure 4. Percentages of maxillary BOP
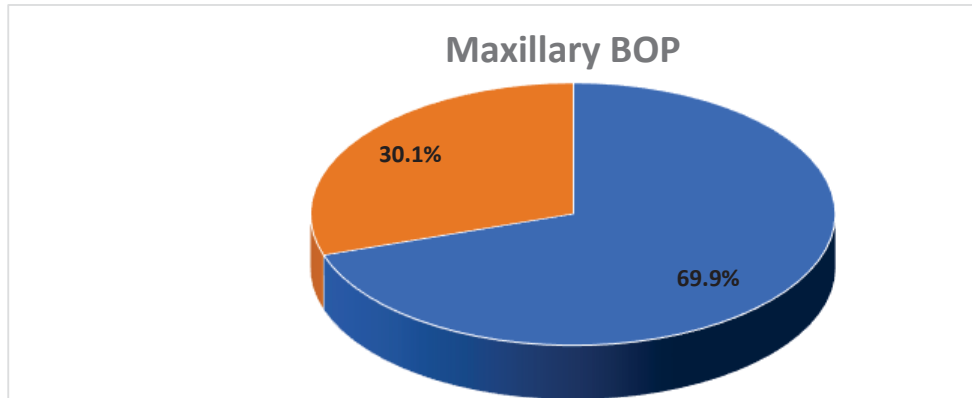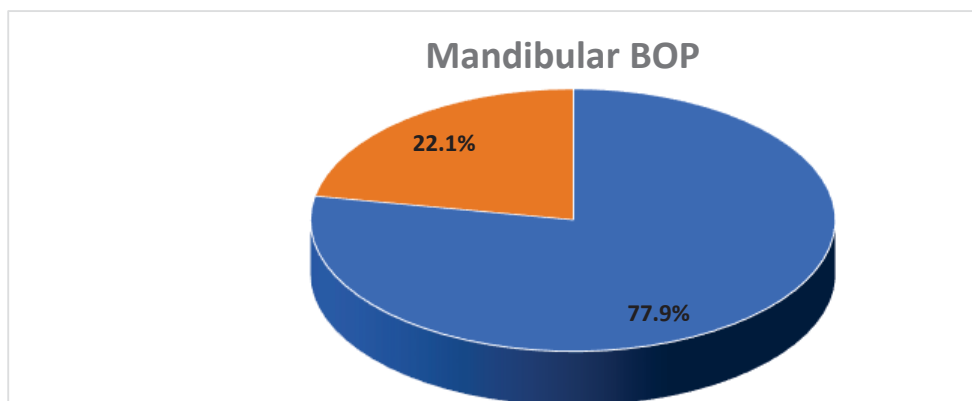
Mandibular BOP

Figure 5. Percentages of mandibular BOP

DISCUSSIONS

The manner for measuring plaque-induced gingivitis is very important when we try to compare different results from different studies. In this study we chose to use Silness and Löe gingival index (GI) for all teeth but third molars. The chances for someone to have all gingival surfaces of all teeth without any inflammation are low. Moreover, the GI score no. 1 does not involve any gingival bleeding, so any change in gingival colour may lead to a gingival "inflammation". Therefore, the examiners must be very well prepared and calibrated before the study begins.

Measuring plaque-induced gingivitis only with BOP or with others bleeding scores may be a way to make clinical assessment more facile because they are much more visible clinical criteria. Therefore, the examiner can identify easier plaque-induced gingivitis and can save more time in clinical exams. That is the main reason why researches prefer bleeding scores in their clinical protocols. However, in this case we are tempted to believe that prevalence of plaque-induced gingivitis is somehow underestimated since clinical sigs such as discrete changes in gingival colour or slight edema (GI score no. 1) are excluded.

In our study the differences are obvious: 91% (GI > 0) or 45% (GI = 2 or 3) vs 37% (BOP > 0) [4].

There are researches who prefer to use GI [8,9], or BOP [10], or both [11].

Chavez et al concluded that BOP is more related with inflammatory changes from the base of gingival sulcus being a real predictor for periodontal breakdown and GI is more used for marginal inflammatory changes [12].

CONCLUSIONS

Epidemiological studies of gingivitis require a deep analysis for choosing the proper method for measuring. BOP has more obvious clinical criteria but GI shows a prevalence closer to reality.

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