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Analysis of Cross-Sectional and Retrograde Data on the Prevalence of Marginal Gingivitis

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Abstract**—**Introduction: Marginal gingivitis is a disease with considerable frequency among patients who present routinely for periodontal control and treatment. In fact, this disease may not have alarming symptoms in patients and may go unnoticed by themselves when personal hygiene conditions are optimal. The aim of this study was to collect retrograde data on the prevalence of marginal gingiva in the respective group of patients, evaluated according to specific periodontal diagnostic tools. Materials and methods: The study was conducted in two patient groups. The first group was with 34 patients, during December 2019-January 2020, and the second group was with 64 patients during 2010-2018 (each year in the mentioned monthly period). Bacterial plaque index, hemorrhage index, amount of gingival fluid, presence of xerostomia and candidiasis were recorded in patients. Results: Analysis of the collected data showed that susceptibility to marginal gingivitis shows higher values according to retrograde data, compared to cross-sectional ones. Susceptibility to candidiasis and the occurrence of xerostomia, even in the combination of both pathologies, as risk factors for the occurrence of marginal gingivitis, show higher values according to retrograde data. The female are presented with a reduced bacterial plaque index than the males, but more importantly, this index in the females is also associated with a reduced index of gingival hemorrhage, in contrast to the males. Conclusions: Cross-sectional data show that the prevalence of marginal gingivitis is more reduced, compared to retrograde data, based on the hemorrhage index and the bacterial plaque index together. Changes in production in the amount of gingival fluid show a higher prevalence of marginal gingivitis in cross-sectional data than in retrograde data; this is based on the sophistication of the way data are recorded, which evolves over time and also based on professional sensitivity to this phenomenon.

Keywords**—**Marginal gingivitis, cross-sectional, retrograde, prevalence.

I. Introduction

MARGINAL gingivitis, with typical signs of disease extending to the gingival margin, is the element that pushed interest in realizing the purpose of this study. Like any inflammation, marginal gingivitis has characteristic signs of inflammation where gingival erythema is noticeable, which is not persistent, but is pronounced in areas where the bacterial plaque is more concentrated [1]-[3]. Marginal gingivitis is the onset of further aggravating gingival diseases. This infection is the beginning of diseases that can further aggravate, even to the irreversible transition to periodontitis as long as the prophylactic and treatment intervention of marginal gingivitis is prophylactic intervention, even for inflammatory diseases of the following dental structures [4]-[8].

The study aims to collect retrospective data on the prevalence of marginal gingivitis. Having both types of studies for the purpose of data collection, it is possible to find possible correlations on the effect of risk factors for the occurrence of marginal gingivitis, the effect of local dental factors on the formation of bacterial plaque and then on the occurrence of local marginal gingivitis, in the individual local extent of marginal gingivitis or the extent of this infection divided or not depending on the sex, age of the affected individuals. An important data that enable this study to collect and process the recorded data, is the possibility are finding correlations of this diagnosis and the presence of other hard and soft tissue lesions. Gingival fluid is another element that should be mentioned in this paragraph for the fact that it affects the wetting, rinsing of gingival sulcus, enabling the removal of food debris, epithelial desquamation, bacterial debris, but above all prevents the initial bacterial adhesion and how resulting in the formation of bacterial plaque. Seen from this perspective, gingival fluid serves as a gingival defense mechanism, and as a barrier and perhaps even a cure for marginal gingivitis, the easier stage of gingivitis that can progress further into periodontitis [9]-[21].

Retrograde studies allowing long-term data collection are studies that require time and human resources in data collection and processing. The same can be said for cross-sectional studies, when applied to a large population. Cross-sectional studies in cases of marginal gingivitis require the selection of the necessary tools for proper diagnosis of this infection. This is because the tool is easily applicable from a wide range of human resources, with the aim of collecting distinct marginal gingivitis data. Cross-sectional study evaluates elements that are measured at the same time in different individuals. This means that in this moment, at a certain or random number of patients that are presented *ad-hoc* in the dental clinic, or within a short period of time, 0-2 months, different stages or severity of marginal gingivitis, are observed [22]-[28]. It can be controlled the extent of the disease in the same oral cavity, or in a certain number of patients. Patient variables can be recorded by gender and age, aiming to find the extent of the disease by gender or age intervals [1], [5], [9], [13], [29]-[31]. The same data are recorded through retrospective studies, but if the tool diagnostic is the same, coping results is the most demanding and logical and intriguing element possible. The convenience of retrospective study lies in the fact that the number of patients can always be pre-selected [32], [33]. Time is not zero but the time interval during which the study is included is also this default element. Patient age and gender variables make values more interesting and correlated. If for the retrospective

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study its duration can be several years, 5 years, 10 years, 15 years, etc., for the cross-sectional study the shorter the duration and the greater the number of patients included in the study, the better is in the results collected and in their processing [4], [7], [14], [18], [32], [34]-[36].

II. Materials and Methods

Analyzing cross-sectional and retrospective data on the prevalence of marginal gingivitis would require coping with figures recorded and conceived at two different times and moments. The aim of the study is to record data on the prevalence of marginal gingivitis at different and varied age intervals. To meet the purpose of the study, data were collected on two groups of patients. The first group includes patients who presented ad-hoc at the Dental Clinic of Albanian University, in the period October 2019 - January 2020 for the next periodontal treatment. The second group of patients are also patients of the Dental Clinic of Albanian University but presented in the period October-November in the annual interval 2010-2018 (every year in the mentioned monthly period). The patients of the first group agreed to be included in the study verbally, of course while maintaining the anonymity of the recorded data. For the patients of the second group, the data recording was performed in the completed periodontal cards at the respective times. Each periodontal card is initialed by the patient.

TABLE I
Natural Tooth Number Data: Gender, for the First Group of Patients

Natural teeth	Female	%	Male	%	Total	%
Number till 10	3	9%	1	3%	4	12%
Number till 11-20	6	18%	-	0%	6	18%
Number till 20-31	9	26%	7	21%	16	47%
Number 32	5	15%	3	9%	8	24%
Total	23	68%	11	33%	34	100%

TABLE II
Natural Tooth Number Data: Gender, for the Second Group of Patients

Natural teeth	Female	%	Male	%	Total	%
Number till 10	6	9%	8	13%	14	22%
Number till 11-20	6	9%	10	16%	16	25%
Number till 20-31	8	13%	16	25%	24	38%
Number 32	6	9%	4	6%	10	15%
Total	26	40%	38	60%	64	100%

TABLE III
Healthy Patient Data: Gender, Based on Periodontal Indices, for the First Group of Patients.

Indexes	Female	%	Male	%	Total	%
Bacterial Plaque Index	10	29%	3	9%	13	38%
Bleeding index	5	15%	1	3%	6	18%
Bacterial Plaque Index/Bleeding index	3	9%	0	0%	3	9%

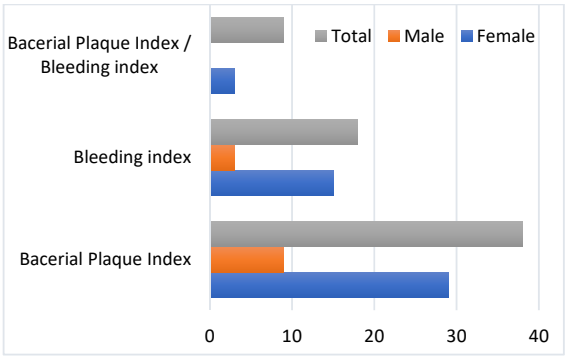

Fig. 1 The data of healthy patients: gender, based on periodontal indices, for the first group of patients

TABLE IV
Healthy Patient Data: Gender, Based on Periodontal Indices, for the Second Group of Patients

Indexes	Female	%	Male	%	Total	%
Bacterial Plaque Index	15	23%	7	11%	22	34%
Bleeding index	12	19%	5	9%	17	28%
Bacterial Plaque Index/Bleeding index	8	13%	2	3%	10	16%

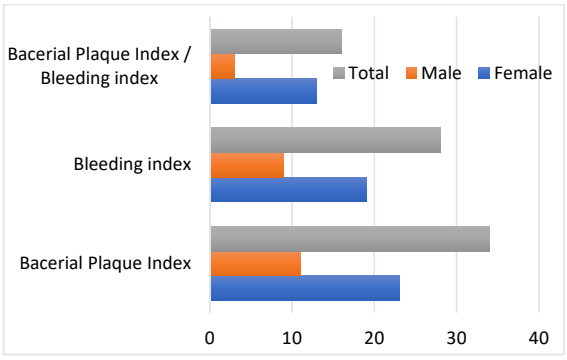

Fig. 2 The data of healthy patients: gender, based on periodontal indices, for the second group of patients

The ways of diagnosing xerostomia near the dental armchair are different. In our study we selected a simple way. By pressing the filter paper which rests on the dorsal surface of the tongue for 5 seconds, we see how wet the surface of the filter paper is. If the surface of the filter paper is 1 cm or more we cannot talk about the presence of xerostomia, if this area is less than 1 cm, then we accept the presence of xerostomia [29]-[32]. Gingival fluid measurement was performed with red absorbent paper used for drying root canals during endodontic treatments. Duration is 1 minute positioned inside the gingival sulcus. Then, as the red endodontic paper-point is removed from the gingival sulcus it is measured in millimeters, it is wet paper point. Based on the literature data, the amount of gingival fluid produced in one of the areas on the tooth surfaces, in red paper-point absorbent paper, placed for 1 minute inside the sulcus, 3 mm-ra is normal. The highest amount of moisture is higher than 3 mm, and the reduced amount is less than 3 mm in cases when the absorbent paper is wet [1], [4].

TABLE V
RECORDED DATA ON THE AMOUNT OF GINGIVAL FLUID, FOR THE GROUP OF PATIENTS ON CROSS-SECTIONAL DATA

Amount of gingival fluid	Normal	%	Pathology	%	Total	P
Mandibular Canines	16	47%	18	53%	34	0.6243
Maxillary Molar	13	38%	21	62%	34	

The two-tailed P value equals 0.6243
The association between rows (groups) and columns (outcomes) is considered to be not statistically significant.

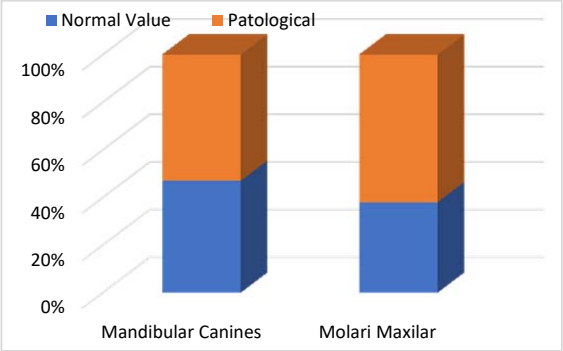

Fig. 3 The recorded data on the amount of gingival fluid, for the group of patients on cross-sectional data

TABLE VI
RECORDED DATA ON THE AMOUNT OF GINGIVAL FLUID, FOR THE GROUP OF PATIENTS ON RETROGRADE DATA

Amount of gingival fluid	Normal	%	Pathology	%	Total	P
Mandibular Canines	34	53%	30	47%	64	0.2149
Molari Maxilar	26	41%	38	59%	34	

The two-tailed P value equals 0.2149
The association between rows (groups) and columns (outcomes) is considered to be not statistically significant.

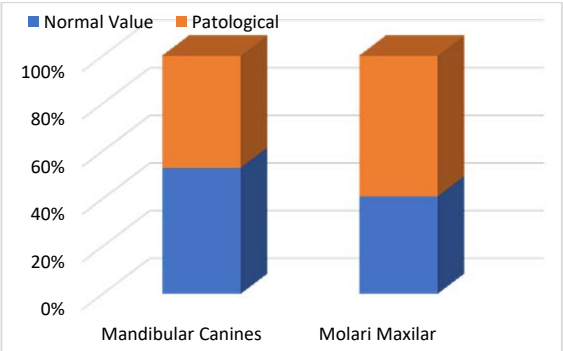

Fig. 4 The recorded data on the amount of gingival fluid, for the group of patients on retrograde data

III. RESULTS

After collecting the data and registering the excel spreadsheet, the following statistical processing was performed. Patients involved in the collection and processing of cross-sectional study data were referred to as first-group patients and patients for retrograde data were referred to as second-group patients. Table I shows the recorded data on dental health status, for the group of patients on cross-sectional data. Table II shows the recorded data on dental health status, for the group of patients on retrograde data. Table III presents data regarding plaque index and bleeding index depending on the patient's gender. Table IV and Fig. 2 show the recorded data on dental health status, for the group of patients on retrograde data.

TABLE VII
THE DATA FOR THE TWO GROUPS DIVIDED INTO THE AREAS WHERE THE MEASUREMENTS WERE PERFORMED

Gingival fluid	Mandibular Canines	%	Maxillary Molar	%
0-3mm	50	51%	39	40%
4-6mm	25	26%	31	31%
7-10mm	23	23%	28	29%
Total	98	100%	98	100%

TABLE VIII
THE RELATIONSHIP BETWEEN EVALUATION AS HEALTHY BY BACTERIAL PLAQUE INDEX AND EVALUATION AS NORM FROM THE AMOUNT OF GINGIVAL FLUID MEASURED IN THE MANDIBULAR CANINE

Gingival fluid	Healthy	Pathological	P
Normal	35	4	0.0001
Pathological	4	59	

The two-tailed P value is less than 0.0001
The association between rows (groups) and columns (outcomes) is considered to be extremely statistically significant.

TABLE IX
THE RELATIONSHIP BETWEEN THE ASSESSMENT AS HEALTHY BY THE BACTERIAL PLAQUE INDEX AND THE ASSESSMENT AS THE NORM FROM THE AMOUNT OF GINGIVAL FLUID MEASURED TO THE MAXILLARY MOLAR

Gingival fluid	Healthy	Pathological	P
Normal	35	15	0.0001
Pathological	15	48	

The two-tailed P value is less than 0.0001
The association between rows (groups) and columns (outcomes) is considered to be extremely statistically significant.

TABLE X
XEROSTOMIA DATA: CANDIDIASIS FOR THE FIRST GROUP OF PATIENTS

Patients	Xerostomia	%	Candidiasis	%	Xerostomia-Candidiasis	%
20-30 years	2	6%	1	3%	-	0%
31-50 years	5	15%	3	9%	1	3%
51-years	2	6%	2	6%	2	6%
Total	9	27%	6	18%	3	9%

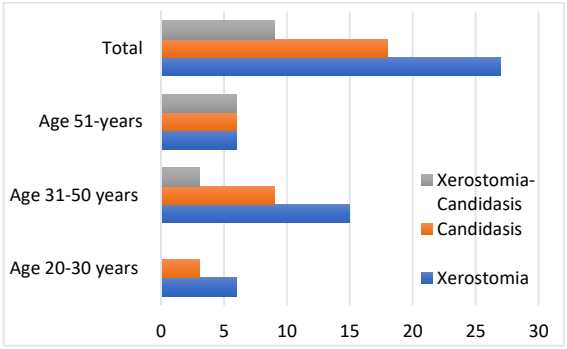

Fig. 5 The data of xerostomia: candidiasis for the first group of patients

Table V and Fig. 3 show the recorded data on the amount of gingival fluid in the mandibular canine, for the group of patients on the cross-sectional data. Table VI and Fig. 4 show the recorded data on the amount of gingival fluid in the mandibular canine, for the group of patients on the retrograde data.

TABLE XI
XEROSTOMIA DATA: CANDIDIASIS FOR THE SECOND GROUP OF PATIENTS

Patients	Xerostomia	%	Candidiasis	%	Xerostomia-Candidiasis	%
20-30 years	2	3%	3	5%	1	2%
31-50 years	8	13%	10	16%	4	6%
51-years	5	8%	12	19%	5	8%
Total	15	24%	25	40%	10	16%

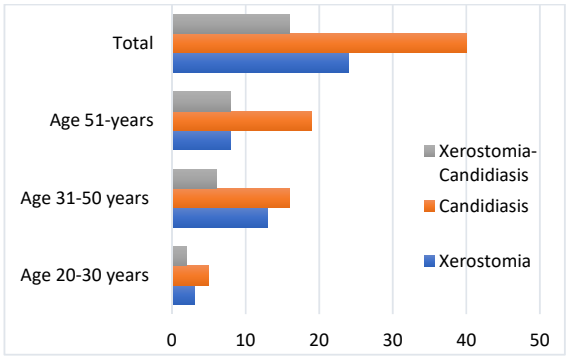

Fig. 6 The xerostomia data: candidiasis for the second group of patients

TABLE XII
GINGIVAL RECESSION DATA: ATTACHMENT LOSS FOR THE FIRST GROUP OF PATIENTS

Patients	Gingival recession	%	Attachment loss	%
0-3mm	25	74%	17	50%
4-6mm	9	26%	16	47%
7-mm	0	0%	1	3%
Total	34	100%	34	100%

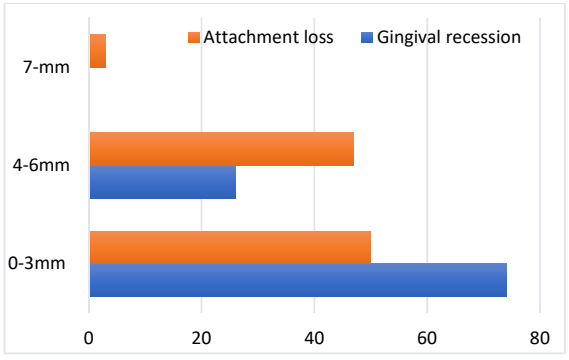

Fig. 7 The data gingival recession: attachment loss for the first group of patients

TABLE XIII
GINGIVAL RECESSION DATA: ATTACHMENT LOSS FOR THE SECOND GROUP OF PATIENTS

Patients	Gingival recession	%	Attachment loss	%
0-3mm	45	71%	34	53%
4-6mm	13	20%	14	22%
7-mm	6	9%	16	25%
Total	64	100%	64	100%

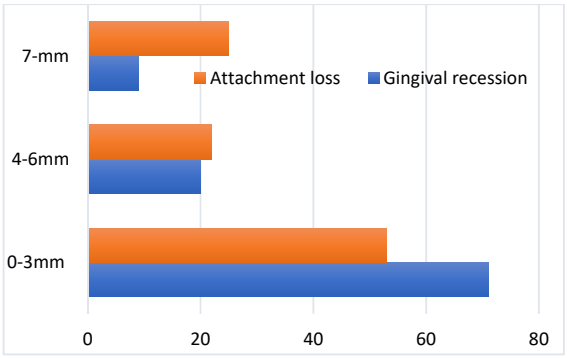

Fig. 8 The data gingival recession: attachment loss for the second group of patients

Fig. 9 Patient aged 20 years with marginal gingivitis. There are signs of inflammation in the gingival margins. We draw attention to the stages of recording data for the study and especially to the high hemorrhage index

IV. DISCUSSIONS

Based on the results, it can be seen that: In the samples of patients included in the study, the first group consisted of 32% female patients and 68% male patients, who were divided according to age groups as follows: age 20-30 years 56%, 31-50 years 32% and 51 years 12 %. The second group was divided into 59% males and 41% females, who divided by age groups 20-30 years old with 53%, 31-50 years old with 20% and 51 years old senior 17%. Higher education amounted to 53% while secondary education amounted to 47% of patients in the first group. For the second group, the division according to the level of education goes for secondary education 39% while for higher education 61%.

Fig. 10 Patient age 44 years, data recorded for the study. We draw attention to the picture showing the dryness on the tongue and the presence of a distinct xerostomia. The gingival hemorrhage index is high

Fig. 11 Gingival health difference with the presence of attachment loss with distinct sulcus depth

For the first group of patients 39% of them were healthy patients according to the bacterial plaque index with 29% female and 10% male. According to the hemorrhage index, healthy patients reach the value of 18%, where 15% are female and 3% are male. Importantly, healthy patients according to the bacterial plaque index and hemorrhage index are 9% of all female patients. For the group of retrograde patients, healthy patients according to the bacterial plaque index are 34% where 23% are female and 11% male. Healthy status according to the hemorrhage index at the retrograde group includes 28% of patients: 19% female and 9% male. It is important that healthy status according to the hemorrhage index and bacterial plaque index is at level of 16%: 13% female - 3% male. Separation according to the amount of gingival fluid produced per unit time in the norm category in the mandibular canine is 47% norm and pathology 53%; the same category of patients with maxillary molar are 38% norm and 62% pathology. The p value indicates statistically significant correlation, over the estimation of the measured amount of gingival fluid, evaluating it as an important element in the evaluation cases of marginal gingival pathology [37]-[40]. At the retrograde group of patients 53% are normal and 47% are pathological according the measurements of gingival fluid at the mandibular canines, while in the maxillary molar these values go 41% norm and 51% pathology. The measured 4-6 mm pathological amount of gingival fluid reaches 26% in the mandibular canine and 31% in the maxillary molar. At values 7-10 mm these percentages go 23% and 29%. The correlation between the bacterial plaque index, within normal or pathological values, and the amount of produced gingival fluid, is expressed by the value p that indicates that these two elements are closely related in the occurrence of marginal gingivitis, for the cross-sectional data and also for the retrograde data. Age 20-30 years for xerostomia reaches the incidence of 6% and candidiasis 3%, but these cases are separate from each other, so there is no candidiasis-xerostomia combination. At age intervals 31-50 years these percentages are: 15% xerostomia, candidiasis 9% and the combination of xerostomia: candidiasis is 3%. Age 51 years and older exhibits 6% candidiasis, 6% xerostomia and 6% is the total xerostomia-candidiasis combination.

For the retrograde group of patients the age range 20-30 years the values are 35, 5% and 2%. v. The age of 51 years represents 8% xerostomia, 19% of which 8% was the xerostomia-candidiasis combination. For the first group of patients' gingival recession 0-3 mm reached 74%, while attachment loss is at level of 50% of clinical cases presented In the 4-6 mm interval, the gingival recession went to 26% while the attachment loss to 47%. 7 mm interval - recession is at 0% while attachment loss is at 3%. For the second group of patients the 0-3 mm gingival recession reached 71%, while attachment loss is at the level 53% of clinical cases presented. In the 4-6 mm interval the gingival recession went to 20% while the attachment loss is at level 22% of clinical cases presented. 7 mm interval - recession is at 9% while attachment loss is at 25%.

Data Processing of Our Study

The level of education affects the care shown by the individual to oral health. Oral health as primary data is

reflected by the number of natural teeth that resist increasing patient age. The other indicator is the bacterial plaque index that reflects the patient's level of hygiene. Reduced bacterial plaque index is presented at the female group of retrograde and of cross-sectional patients, associated with reduced of gingival hemorrhage index. The prevalence of marginal gingivitis is 61%, while the prevalence according to retrograde data goes to 66%.

Cross-sectional data show that female gender represents 91% prevalence of marginal gingivitis, while retrograde data show 84% prevalence of marginal gingivitis. Gingival fluid as a quantity is higher, produced in the maxillary molar than in the mandibular canine, both in the cross-sectional group and in the retrograde group.

Marginal gingivitis caused by xerostomia-induced candidiasis, in cross-sectional data goes to 9%, while in retrograde data goes to 16%. Retrograde data show higher percentage difference versus attachment loss and gingival recession values than cross-sectional data for 0-3 mm values. Attachment loss dominates with a higher percentage difference in the cross-sectional group than in the retrograde group if we talk about 4-6 mm levels. Interval 7 mm - recession is at 9% while attachment loss is at 25%, these retrograde values show high values versus attachment loss.

V. Conclusions

Marginal gingivitis according the prevalence is lower at cross-sectional group of patients and higher at retrograde patients. This is in association with the reduced prevalence of risk factors such as candidiasis and xerostomia. Female sex is presented with reduced bacterial index and with reduced gingival hemorrhage index, compared with male sex, according the cross-sectional and retrograde data. Data on amount of gingival fluid produced at marginal gingivitis presented at patients, show higher prevalence of marginal gingivitis at cross-sectional group of patients.

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