

Epidemiological study regarding the frequency of the "white spot" lesion

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Summary

The preventive programmes applied to the young people have to be based on epidemiological studies in which the pre-cavitated lesion must be included.

The aim of the study is to evaluate the frequency of the "white spot" lesions in a large group of children from Constanta, aged between 8 and 13 years.

Material and methods: the study was conducted on 1024 children. As diagnostic methods was used: the clinical exam associated with a dye as a guide for the sub-surface lesions, the bitewing radiographical exam and the measurement of the laser-induced fluorescence of the enamel by using the Diagnodent method.

Results: 16.82% from the examined surfaces have pre-cavitated lesions and all the occlusal and approximal surfaces of the lateral teeth are susceptible at caries in the first years after eruption of the teeth.

Conclusion: much more attention has to be directed to the early identification and conservative treatment of the pre-cavitated lesions of the enamel.

Key words: early diagnosis, white spot, pre-cavitated lesion, preventive programmes, conservative therapy.

Introduction

In the dental literature, the first stage of the enamel caries is known as the "pre-cavitated" or "non-cavitated" lesion.

Although the frequency of the "white spot" lesion, its presence in the oral cavity, is higher than the frequency of the cavitated decay, the pre-cavitated lesion was unnoticed by the practitioners, waiting for the next cavity stage for its inclusion in the epidemiological studies and for applying an adequate therapy.

The omission of the enamel stage of caries is due both to the absence of the special diagnostic tools, and also to the type of the development of this first stage of caries, keeping an unaffected surface layer.

For many years, the frequency of caries was given by the DMFT and DMFS indices [6, 10, 11], as a quantitative expression of the carious activity of a person. There are a lot of limitations regarding the power of these indices to express the real degree of the carious activity, the most

important being the necessity for the identification of the "white spot" lesions for an adequate evaluation of the dental health.

Although the recording of the first stage of the enamel caries is submitted to errors, the epidemiological studies have to make the difference between the health surfaces, the surfaces with pre-cavitated lesions and the cavitated lesions.

Even the epidemiological studies show a marked reduction of the frequency of the dental caries in children in many industrialized countries following the widely used preventive measures [4, 7], the "white spot" lesions of the occlusal and approximal surfaces are still a major problem for the young people [8, 11].

From all the epidemiological studies in the young people, just a small number have recorded the "white spot" lesions, many of them referring only to the cavitated lesions. The consequence is the recording of a smallest number of caries [2, 10], affecting the values of the founded indices and also the percents of the caries-free children, because the young people have both

cavitated lesions, but also an important number of pre-cavitated lesions.

Because the pre-cavitated lesions have a higher frequency than the cavitated caries, and the new directions of the dentistry treatment have as a basis the prevention and the conservative therapy, the recording of the "white spot" lesions in all epidemiological studies has a major importance for an accurate evaluation of the carious activity of a community and for a correct assessment of the real treatment needs.

In the same time the "white spot" lesions have to be included also as a caries-risk factor [3, 5, 10] because they can progress and become cavitated in time, their identification being thus important.

For a real success of the preventive programs applied in young people, some principles, based on the frequency of the pre-cavitated lesions, studied on widely people communities, must be adopted.

Because the "white spot" lesion can be arrested and then remineralized [1, 10, 12] by the use of fluorides, all efforts have to be directed to the early diagnosis and the correct identification of all carious lesions, starting with the first stage.

In the light of the omnipresence of fluorides, we must determine the best topic and systemic method of administration which can be applied for a maximum reducing of the dental caries.

The aim of the study is to establish the frequency of the "white spot" lesions in a large group of children from Constanta city.

Material and method

The study group comprises 1024 children aged 8 to 13 years. The subjects are divided by sex and shared in 5 age groups (*table 1*).

Table 1. Distribution of the study group by age and sex

age	8-9 years	9-10 years	10-11 years	11-12 years	12-13 years	the total number
girls	106	132	92	120	100	550
boys	108	102	88	92	84	474

In the same time with the frequency of the "white spot" lesions, the cronology of eruption of the permanent teeth was studied on these sub-

jects [9]. Based on the eruption period, a number of teeth was examined for each age group, as shown in *Table 2*.

Table 2. Number and type of the teeth considered for each age group

tooth/age	8-9 years	9-10 years	10-11 years	11-12 years	12-13 years
M1	4	4	4	4	4
PM	-	1	2	4	8
M2	-	-	-	-	3

For each tooth certain surfaces were examined, as follows:

- For the first permanent molar: the occlusal surfaces, the buccal lower and upper oral surfaces, the approximal surfaces and the smooth surfaces (upper buccal and lower oral) surfaces.
- For the premolars and the second permanent molars: the occlusal surfaces and the approximal surfaces.

The frequency of the incipient caries was separately evaluated for each age group, related

to the number of the surfaces on the same type, for each tooth (M1, PM, M2) and the total number of the examined surfaces of all the teeth included in the study.

As **diagnosis methods**, we used:

1. clinical examination by visual examination (*figure 1*) and by palpation with a blunt probe; the clinical examination was associated with the use of a dye substance (*figure 2*), indicating the sub-surface lesion.

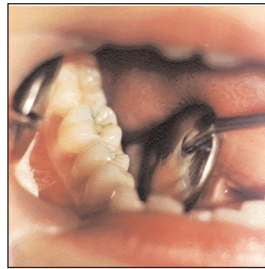


Figure 1. J.L., 12 years old boy: "white spot" lesion at the cervical level of a lower canine; the increased porosity and the white colour can be seen.

Figure 2. P.I., 13 years old girl: "white spot" occlusal lesions (4.4., 4.5., 4.6), observed after the used of the dye lesions.

2. bitewing radiograph examination, used for the identification of the approximal incipient caries of the lateral teeth; the enamel lesion

appears on the radiograph as a small, triangular, radiolucent area (*Figure 3*).

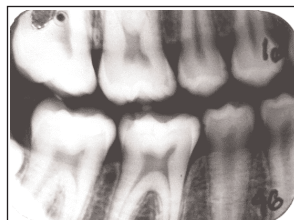


Figure 3. P.I., 13 years old girl: a bitewing radiograph showing early carious lesions on 1.6., 1.5., 1.4., 4.5., 4.6.

3. the measurement of the laser-induced fluorescence of the enamel by the use of Diagnodent apparatus (*figure 4*) (KaVo). With

this method, the incipient lesion is quantified in values between 5 and 30 (*figure 5*).

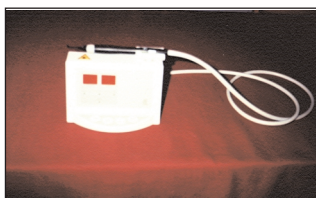


Figure 4. The Diagnodent apparatus used in this study.

Figure 5. The exam of the occlusal surface of a first permanent upper molar (2.6) with the probe of the Diagnodent; the indicated value is 23, corresponding to a pre-cavitated lesion.

Results

The total number of the subjects included in the study is 1024, and the total number of the examined surfaces is 30.876 (*table 3*).

Table 3. The distribution of the examined surfaces in each age and sex group

Sex/age	8-9 years	9-10 years	10-11years	11-12 years	12-13 years	no. of examined surfaces
girls (550)	2120	3034	2392	3840	5300	16.686
boys (474)	2160	2346	2288	2944	4452	14.190
no. of examined surfaces	4280	5380	4680	6784	9752	30.876

The frequency of the "white spot" lesions related to the total number of the examined

surfaces (30.876) is 16,82%, given by a number of 5194 incipient carious lesions (*table 4*).

Table 4. The frequency of the "white spot" lesions related to the total number of the examined surfaces

	frequency/no. of lesions/age group	8-9 years	9-10 years	10-11 years	11-12 years	12-13 years	mean values
girls	frequency	20.7%	24.2%	21%	10%	19%	18.98%
	no. of lesions	438 S	734 S	503 S	380 S	1009 S	3064 S
boys	frequency	11.2%	21.4%	12.9%	11.4%	17%	14.8%
	no. of lesions	242 S	502 S	294 S	336 S	756 S	2130 S
means value	frequency	15.95%	22.8%	16.95%	10.7%	18%	16.82%
	no. of lesions	680 S	1236 S	797 S	716 S	1765 S	5194 S

The mean values are higher in girls (18.98%), comparing with the boys (14.8%).

years group, in which the frequency is higer in boys, but the difference is not statistically significant (*figure 6*).

Related to the age, the frequency in girls is higher in all age groups, excepting the 11-12

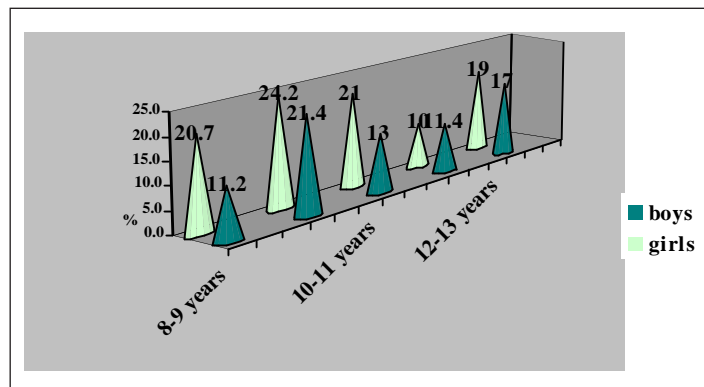


Figure 6. The frequency of the "white spot" lesions related to the total number of the examined surfaces for girls and boys

The frequency of the "white spot" lesions related to **the total number of the first molar's**

surfaces (20.478) is 16.3%, given by a number of 3366 lesions (*table 5*).

Table 5. The frequency of the "white spot" lesions related to the total number of the first permanent molars

	frequency/no. of lesions/age group	8-9 years	9-10 years	10-11 years	11-12 years	12-13 years	mean values
girls	frequency	20.7%	24.6%	22%	9.45%	17.1%	%
	no. of lesions	438 S	649 S	405 S	227 S	341 S	3064 S
boys	frequency	11.2%	22%	11.2%	8.3%	15.7%	14.8%
	no. of lesions	242 S	450 S	197 S	153 S	264 S	2130 S
means value	frequency	15.95%	23.3%	16.6%	8.875%	18%	16.3%
	no. of lesions	680 S	1099 S	602 S	380 S	1765 S	3366 S

The frequency is higher in girls in all age groups, with significant differences in 8-9 years (9.5%) and 10-11 years (10.8%) age groups.

The maximum values are in the 9-10 years age group, in girls (24.6%) and also in boys (22%).

The minimum values are in the 11-12 years age group, in girls (9.5%) and also in boys (8.3%).

The frequency of the "white spot" lesions related to **the total number of the occlusal first molar's surfaces** (4096) is 25.66%, given by a number of 1051 lesions (*table 6*).

Table 6. The frequency of the "white spot" lesions related to the total number of the occlusal first molar's surfaces

	frequency/no. of lesions/age group	8-9 years	9-10 years	10-11 years	11-12 years	12-13 years	mean values
girls	frequency	35.8%	36.3%	30.3%	20%	11.6%	26.8%
	no. of lesions	152 S	191 S	111 S	96 S	46 S	596 S
boys	frequency	31.9%	32.4%	26.7%	13.9%	11.9%	23.36%
	no. of lesions	138 S	132 S	94 S	51 S	40 S	455 S
means value	frequency	33.85%	34.35%	28.5%	16.95%	11.75%	25.66%
	no. of lesions	290 S	323 S	205 S	147 S	86 S	1051 S

This frequency is higher for the girls in all age groups, excepting the 12-13 years age group. It is maximum for both sex groups in the 9-10 years age group, then decreasing.

The frequency of the "white spot" lesions related to **the total number of the approximal first molar's surfaces** (8192) is 26.87%, given by a number of 2193 lesions (*table 7*).

Table 7. The frequency of the "white spot" lesions related to the total number of the approximal first molar's surfaces

	frequency/no. of lesions/age group	8-9 years	9-10 years	10-11 years	11-12 years	12-13 years	mean values
girls	frequency	22.3%	26.3%	30.0%	28.7%	27%	26.86%
	no. of lesions	189 S	277 S	220 S	275 S	216 S	1177 S
boys	frequency	24.5%	25.4%	31.5%	28.54%	24.5%	26.88%
	no. of lesions	212 S	207 S	222 S	210 S	165 S	1016 S
means value	frequency	23.40%	25.85%	30.75%	28.62%	25.75%	26.87%
	no. of lesions	401 S	484 S	442 S	485 S	381 S	2193 S

This frequency is gradually increasing till 10-11 years (30% in girls and 31.5% in boys), then is slightly decreasing, but is still remaining

at important values also at 12-13 (27% in girls and 24.5% in boys) years.

The frequency of the "white spot" lesions related to **the total number of the lower buccal and upper oral first molar's surfaces**

(4096) is 19.28%, given by a number of 790 lesions (*table 8*).

Table 8. Frequency of the "white spot" lesions related to the total number of lower buccal and upper oral *first molar's surfaces*

	frequency/no. of lesions/age group	8-9 years	9-10 years	10-11 years	11-12 years	12-13 years	mean values
girls	frequency	17.3%	29.1%	16.3%	18.7%	16%	19.48%
	no. of lesions	73 S	153 S	60 S	90 S	64 S	440S
boys	frequency	14.7%	23.7%	20.4%	19.2%	13.7%	18.34%
	no. of lesions	64 S	97 S	72 S	71 S	46 S	350 S
means	frequency	16%	26.4%	18.35%	18.95%	14.85%	19.28%
value	no. of lesions	137 S	250 S	132 S	161 S	110 S	790 S

The frequency of the "white spot" lesions related to **the total number of the smooth first**

molar's surfaces (4096) is 3.95%, given by a number of 162 lesions (*table 9*).

Table 9. The frequency of the "white spot" lesions related to the total number of the smooth (upper buccal and lower oral) first molar's surfaces

	frequency/no. of lesions/age group	8-9 years	9-10 years	10-11 years	11-12 years	12-13 years	mean values
girls	frequency	5.6%	5.1%	3.8%	2.9%	3.75%	4.23%
	no. of lesions	24 S	27 S	14 S	14 S	15 S	94 S
boys	frequency	5%	3.4%	2.5%	2.7%	3.7%	3.46%
	no. of lesions	22 S	14 S	9 S	10 S	13 S	68 S
means	frequency	5.3%	4.25%	3.15%	2.8%	3.72%	3.95%
value	no. of lesions	46 S	41 S	23 S	24 S	28 S	162 S

The frequency is maximum in the 8-9 years age group in girls (5.6%) and in the 9-10 years age group for the boys (5.1%), decreasing slightly after these ages.

The frequency of the "white spot" lesions related to **the total number of the premolar's examined surfaces** (8.742) is 17.63%, given by a number of 1545 lesions (*table 10*).

Table 10. The frequency of the "white spot" lesions related to the total number of the examined premolar's surfaces

	frequency/no. of lesions/age group	9-10 years	10-11 years	11-12 years	12-13 years	mean values
girls	frequency	21.5%	17.8%	20.4%	17.2%	19.20%
	no. of lesions	85 S	98 S	294 S	413 S	890 S
boys	frequency	17%	18.4%	16.6%	16%	17%
	no. of lesions	52 S	97 S	183 S	323 S	655 S
means	frequency	19.25%	18.1%	18.5%	16.6%	17.63%
value	no. of lesions	137 S	195 S	477 S	736 S	1545 S

The frequency of the lesions is more important for the girls in all age groups, excepting the

group of 11-12 years. The maximum values of the frequency of the "white spot" lesions on the

Table 11. The frequency of the "white spot" lesions related to the total number of the occlusal premolar's surfaces

	frequency/no. of lesions/age group	9-10 years	10-11 years	11-12 years	12-13 years	mean values
girls	frequency	38.8%	28.2%	25.8%	21.1%	28.4%
	no. of lesions	51 S	52 S	124 S	169 S	396 S
boys	frequency	21.6%	23.7%	19.6%	20.3%	21.3%
	no. of lesions	22 S	42 S	72 S	136 S	272 S
means value	frequency	30.2%	25.95%	22.7%	20.7%	22.9%
	no. of lesions	73 S	94 S	196 S	305 S	668 S

premolar's surfaces are 21.5% at 9-10 years age group for girls and 18.4% at 10-11 years age group for boys.

The frequency of the "white spot" lesions related to **the total number of the occlusal premolar's surfaces** (2.914) is 22.9%, given by a number of 668 lesions (*table 11*).

Table 12. The frequency of the "white spot" lesions related to the total number of the approximal premolar's surfaces

	frequency/no. of lesions/age group	9-10 years	10-11 years	11-12 years	12-13 years	mean values
girls	frequency	13%	12.6%	17.7%	15.3%	14.65%
	no. of lesions	34 S	46 S	170 S	244 S	494 S
boys	frequency	14.9%	15.6%	15.2%	14%	14.92%
	no. of lesions	30 S	55 S	111 S	187 S	383 S
means value	frequency	13.95%	14.1%	16.45%	14.65%	14.8%
	no. of lesions	64 S	101 S	281 S	431 S	877 S

The frequency is higher for girls than the boys, with significant differences only for the 9-10 years age group.

The frequency of the "white spot" lesions related to **the total number of the approximal premolar's surfaces** (5828) is 14.8%, given by a number of 877 lesions (*table 12*).

Table 13. The frequency of the "white spot" lesions related to the total number of the second permanent molar's surfaces

	frequency/no. of lesions/ 12-13 years age group	occlusal surfaces	approximal surfaces	mean values
girls	frequency	35.3%	24.9%	30.1%
	no. of lesions	106 S	149 S	255 S
boys	frequency	31.8%	17.6%	24.7%
	no. of lesions	80 S	89 S	169 S
means value	frequency	33.55%	21.25%	27.4%
	no. of lesions	S	S	424 S

The frequency has relatively higher and constant values between 9 and 13 years, because of the successively eruption of the premolars.

31.8% for boys) and also on the approximal surfaces (24.9% for girls, 17.6% for boys).

The frequency of the "white spot" lesions related to **the total number of the second permanent molar's surfaces** (1.656) is 27.4%, given by a number of 424 lesions (*table 13*).

The frequency is higher for the girls than boys, on the occlusal surfaces (35.3% for girls,

Discussions

Regarding the most frequently sites of the "white spot" lesions, all studies reports that in children and teenagers, the pits and fissures surfaces are

the most affected. With the increasing of age, the approximal surfaces become more susceptible.

In our study the frequency of the "white spot" lesions for the entire study group is maximum on the occlusal surfaces only for the premolars and for the second permanent molar, and also on the approximal surfaces of the first permanent molar.

These findings are not in contradiction with the dentistry literature, but they are due to the extension in number and age of the study group. On the first permanent molar, the frequency of incipient caries is the most important on the occlusal surfaces till the age of 10-11 years and on the approximal surfaces after this age. The statistical results show that the frequency between 8 and 13 years is higher on the approximal surfaces.

Conclusions

1. The frequency of the "white spot" lesions on the occlusal and proximal surfaces of the permanent lateral young teeth is extremely high and it represents a major problem for children and young people, which must be recognized and studied as a base for preventive measures.
2. The omission of the enamel evolution stage of the caries, in the most cases due to the absence of the special diagnostic tools, has important consequences on the correctness of the epidemiological studies, on the future development of carious activity in young people and also on the planning

and achievement of a real successful conservative, preventive treatment.

3. The early diagnosis of carious lesion by adequate methods (which must include, besides the usual clinical examination, the radiological bitewing examination and modern diagnosis tools) becomes essential for the assessment of first stage enamel lesions.
4. The greatest weight of the "white spot" lesions is given by caries on the first permanent molar, leading for a precocious preventive treatment which has to be applied to these teeth.
5. The frequency of the incipient carious lesions on the first permanent molars is the highest on their occlusal surfaces, decreasing on the approximal, oral and buccal surfaces of these teeth.
6. The early diagnosis of carious lesions has to be done by adequate methods and has to be directed not only on the first permanent molar, but also on the occlusal and approximal surfaces of the all lateral teeth.
7. Recognizing the carious lesion in the first, non-cavitated stage must be the most important goal of all epidemiological studies, as this early diagnosis is the base of a conservative, preventive therapy can arrest the "white spot" lesion through the help of an improved oral hygiene, topical applied fluoride and modified diet, being thus able to "repair" these lesions by stimulating the remineralization processes.

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